Full wwPDB EM Validation Report ⓘ

Apr 16, 2026 – 04:39 pm BST

PDB ID	:	9TPW / pdb_00009tpw
EMDB ID	:	EMD-56117
Title	:	cryo-ET structure of mTOR complex 2 on a PIP2-containing membrane
Authors	:	Hay, I.M.; Ahsan, B.; Williams, R.L.
Deposited on	:	2025-12-18
Resolution	:	6.40 Å(reported)

This is a Full wwPDB EM Validation Report for a publicly released PDB entry.

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/EMValidationReportHelp
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

The following versions of software and data (see references ⓘ) were used in the production of this report:

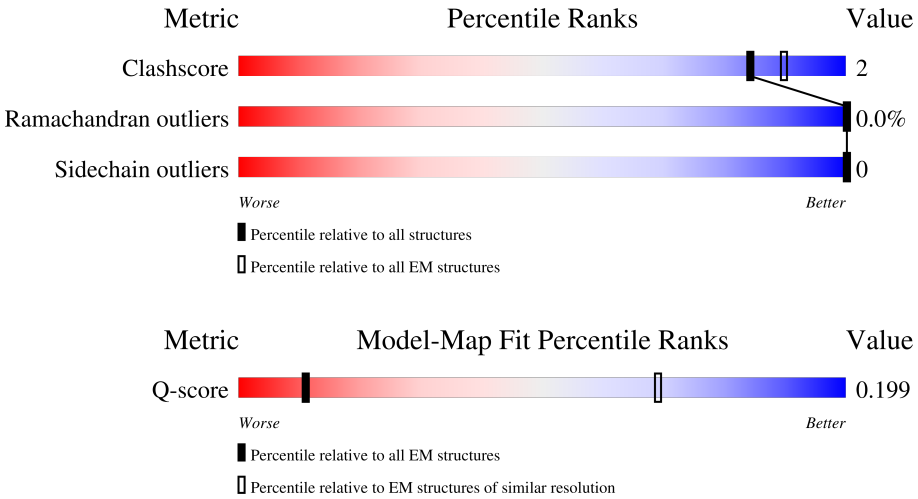
EMDB validation analysis	:	0.0.1.dev132
Mogul	:	1.8.4, CSD as541be (2020)
MolProbity	:	4-5-2 with Phenix2.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics	:	202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 6.40 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	544 (5.90 - 6.90)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5% The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion < 40%). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	2590	35% 82% 6% 13%
1	B	2590	36% 81% 6% 13%
2	C	326	66% 88% 8%
2	D	326	67% 89% 8%

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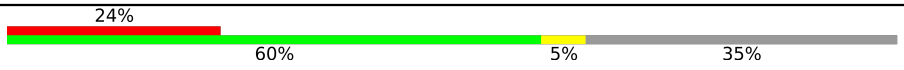
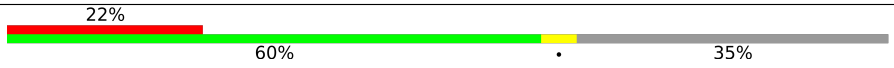
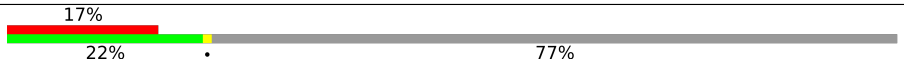
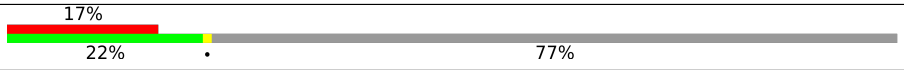
Mol	Chain	Length	Quality of chain
3	E	1734	
3	F	1734	
4	G	522	
4	H	522	

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 61288 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Serine/threonine-protein kinase mTOR.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	2265	Total 18242	C 11626	N 3206	O 3284	S 126	0	0
1	B	2263	Total 18230	C 11619	N 3204	O 3282	S 125	0	0

There are 82 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-40	MET	-	initiating methionine	UNP P42345
A	-39	ALA	-	expression tag	UNP P42345
A	-38	SER	-	expression tag	UNP P42345
A	-37	TRP	-	expression tag	UNP P42345
A	-36	SER	-	expression tag	UNP P42345
A	-35	HIS	-	expression tag	UNP P42345
A	-34	PRO	-	expression tag	UNP P42345
A	-33	GLN	-	expression tag	UNP P42345
A	-32	PHE	-	expression tag	UNP P42345
A	-31	GLU	-	expression tag	UNP P42345
A	-30	LYS	-	expression tag	UNP P42345
A	-29	GLY	-	expression tag	UNP P42345
A	-28	GLY	-	expression tag	UNP P42345
A	-27	GLY	-	expression tag	UNP P42345
A	-26	ALA	-	expression tag	UNP P42345
A	-25	ARG	-	expression tag	UNP P42345
A	-24	GLY	-	expression tag	UNP P42345
A	-23	GLY	-	expression tag	UNP P42345
A	-22	SER	-	expression tag	UNP P42345
A	-21	GLY	-	expression tag	UNP P42345
A	-20	GLY	-	expression tag	UNP P42345
A	-19	GLY	-	expression tag	UNP P42345
A	-18	SER	-	expression tag	UNP P42345
A	-17	TRP	-	expression tag	UNP P42345
A	-16	SER	-	expression tag	UNP P42345
A	-15	HIS	-	expression tag	UNP P42345

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-14	PRO	-	expression tag	UNP P42345
A	-13	GLN	-	expression tag	UNP P42345
A	-12	PHE	-	expression tag	UNP P42345
A	-11	GLU	-	expression tag	UNP P42345
A	-10	LYS	-	expression tag	UNP P42345
A	-9	GLY	-	expression tag	UNP P42345
A	-8	GLU	-	expression tag	UNP P42345
A	-7	ASN	-	expression tag	UNP P42345
A	-6	LEU	-	expression tag	UNP P42345
A	-5	TYR	-	expression tag	UNP P42345
A	-4	PHE	-	expression tag	UNP P42345
A	-3	GLN	-	expression tag	UNP P42345
A	-2	GLY	-	expression tag	UNP P42345
A	-1	GLY	-	expression tag	UNP P42345
A	0	THR	-	expression tag	UNP P42345
B	-40	MET	-	initiating methionine	UNP P42345
B	-39	ALA	-	expression tag	UNP P42345
B	-38	SER	-	expression tag	UNP P42345
B	-37	TRP	-	expression tag	UNP P42345
B	-36	SER	-	expression tag	UNP P42345
B	-35	HIS	-	expression tag	UNP P42345
B	-34	PRO	-	expression tag	UNP P42345
B	-33	GLN	-	expression tag	UNP P42345
B	-32	PHE	-	expression tag	UNP P42345
B	-31	GLU	-	expression tag	UNP P42345
B	-30	LYS	-	expression tag	UNP P42345
B	-29	GLY	-	expression tag	UNP P42345
B	-28	GLY	-	expression tag	UNP P42345
B	-27	GLY	-	expression tag	UNP P42345
B	-26	ALA	-	expression tag	UNP P42345
B	-25	ARG	-	expression tag	UNP P42345
B	-24	GLY	-	expression tag	UNP P42345
B	-23	GLY	-	expression tag	UNP P42345
B	-22	SER	-	expression tag	UNP P42345
B	-21	GLY	-	expression tag	UNP P42345
B	-20	GLY	-	expression tag	UNP P42345
B	-19	GLY	-	expression tag	UNP P42345
B	-18	SER	-	expression tag	UNP P42345
B	-17	TRP	-	expression tag	UNP P42345
B	-16	SER	-	expression tag	UNP P42345
B	-15	HIS	-	expression tag	UNP P42345
B	-14	PRO	-	expression tag	UNP P42345

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-13	GLN	-	expression tag	UNP P42345
B	-12	PHE	-	expression tag	UNP P42345
B	-11	GLU	-	expression tag	UNP P42345
B	-10	LYS	-	expression tag	UNP P42345
B	-9	GLY	-	expression tag	UNP P42345
B	-8	GLU	-	expression tag	UNP P42345
B	-7	ASN	-	expression tag	UNP P42345
B	-6	LEU	-	expression tag	UNP P42345
B	-5	TYR	-	expression tag	UNP P42345
B	-4	PHE	-	expression tag	UNP P42345
B	-3	GLN	-	expression tag	UNP P42345
B	-2	GLY	-	expression tag	UNP P42345
B	-1	GLY	-	expression tag	UNP P42345
B	0	THR	-	expression tag	UNP P42345

- Molecule 2 is a protein called Target of rapamycin complex subunit LST8.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	C	315	Total	C	N	O	S	0	0
			2443	1518	434	473	18		
2	D	315	Total	C	N	O	S	0	0
			2443	1518	434	473	18		

- Molecule 3 is a protein called Rapamycin-insensitive companion of mTOR.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	E	1119	Total	C	N	O	S	0	0
			8990	5732	1584	1625	49		
3	F	1119	Total	C	N	O	S	0	0
			8990	5732	1584	1625	49		

There are 52 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
E	-25	MET	-	initiating methionine	UNP Q6R327
E	-24	ALA	-	expression tag	UNP Q6R327
E	-23	ASP	-	expression tag	UNP Q6R327
E	-22	TYR	-	expression tag	UNP Q6R327
E	-21	LYS	-	expression tag	UNP Q6R327
E	-20	ASP	-	expression tag	UNP Q6R327
E	-19	HIS	-	expression tag	UNP Q6R327
E	-18	ASP	-	expression tag	UNP Q6R327

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Chain	Residue	Modelled	Actual	Comment	Reference
E	-17	GLY	-	expression tag	UNP Q6R327
E	-16	ASP	-	expression tag	UNP Q6R327
E	-15	TYR	-	expression tag	UNP Q6R327
E	-14	LYS	-	expression tag	UNP Q6R327
E	-13	ASP	-	expression tag	UNP Q6R327
E	-12	HIS	-	expression tag	UNP Q6R327
E	-11	ASP	-	expression tag	UNP Q6R327
E	-10	ILE	-	expression tag	UNP Q6R327
E	-9	ASP	-	expression tag	UNP Q6R327
E	-8	TYR	-	expression tag	UNP Q6R327
E	-7	LYS	-	expression tag	UNP Q6R327
E	-6	ASP	-	expression tag	UNP Q6R327
E	-5	ASP	-	expression tag	UNP Q6R327
E	-4	ASP	-	expression tag	UNP Q6R327
E	-3	ASP	-	expression tag	UNP Q6R327
E	-2	LYS	-	expression tag	UNP Q6R327
E	-1	GLY	-	expression tag	UNP Q6R327
E	0	THR	-	expression tag	UNP Q6R327
F	-25	MET	-	initiating methionine	UNP Q6R327
F	-24	ALA	-	expression tag	UNP Q6R327
F	-23	ASP	-	expression tag	UNP Q6R327
F	-22	TYR	-	expression tag	UNP Q6R327
F	-21	LYS	-	expression tag	UNP Q6R327
F	-20	ASP	-	expression tag	UNP Q6R327
F	-19	HIS	-	expression tag	UNP Q6R327
F	-18	ASP	-	expression tag	UNP Q6R327
F	-17	GLY	-	expression tag	UNP Q6R327
F	-16	ASP	-	expression tag	UNP Q6R327
F	-15	TYR	-	expression tag	UNP Q6R327
F	-14	LYS	-	expression tag	UNP Q6R327
F	-13	ASP	-	expression tag	UNP Q6R327
F	-12	HIS	-	expression tag	UNP Q6R327
F	-11	ASP	-	expression tag	UNP Q6R327
F	-10	ILE	-	expression tag	UNP Q6R327
F	-9	ASP	-	expression tag	UNP Q6R327
F	-8	TYR	-	expression tag	UNP Q6R327
F	-7	LYS	-	expression tag	UNP Q6R327
F	-6	ASP	-	expression tag	UNP Q6R327
F	-5	ASP	-	expression tag	UNP Q6R327
F	-4	ASP	-	expression tag	UNP Q6R327
F	-3	ASP	-	expression tag	UNP Q6R327
F	-2	LYS	-	expression tag	UNP Q6R327

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Chain	Residue	Modelled	Actual	Comment	Reference
F	-1	GLY	-	expression tag	UNP Q6R327
F	0	THR	-	expression tag	UNP Q6R327

- Molecule 4 is a protein called Target of rapamycin complex 2 subunit MAPKAP1.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	G	120	Total	C	N	O	S	0	0
			974	603	182	185	4		
4	H	120	Total	C	N	O	S	0	0
			974	603	182	185	4		

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
G	1	ACE	-	acetylation	UNP Q9BPZ7
H	1	ACE	-	acetylation	UNP Q9BPZ7

- Molecule 5 is ZINC ION (CCD ID: ZN) (formula: Zn).

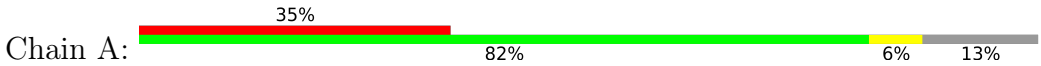
Mol	Chain	Residues	Atoms		AltConf
5	E	1	Total	Zn	0
			1	1	
5	F	1	Total	Zn	0
			1	1	

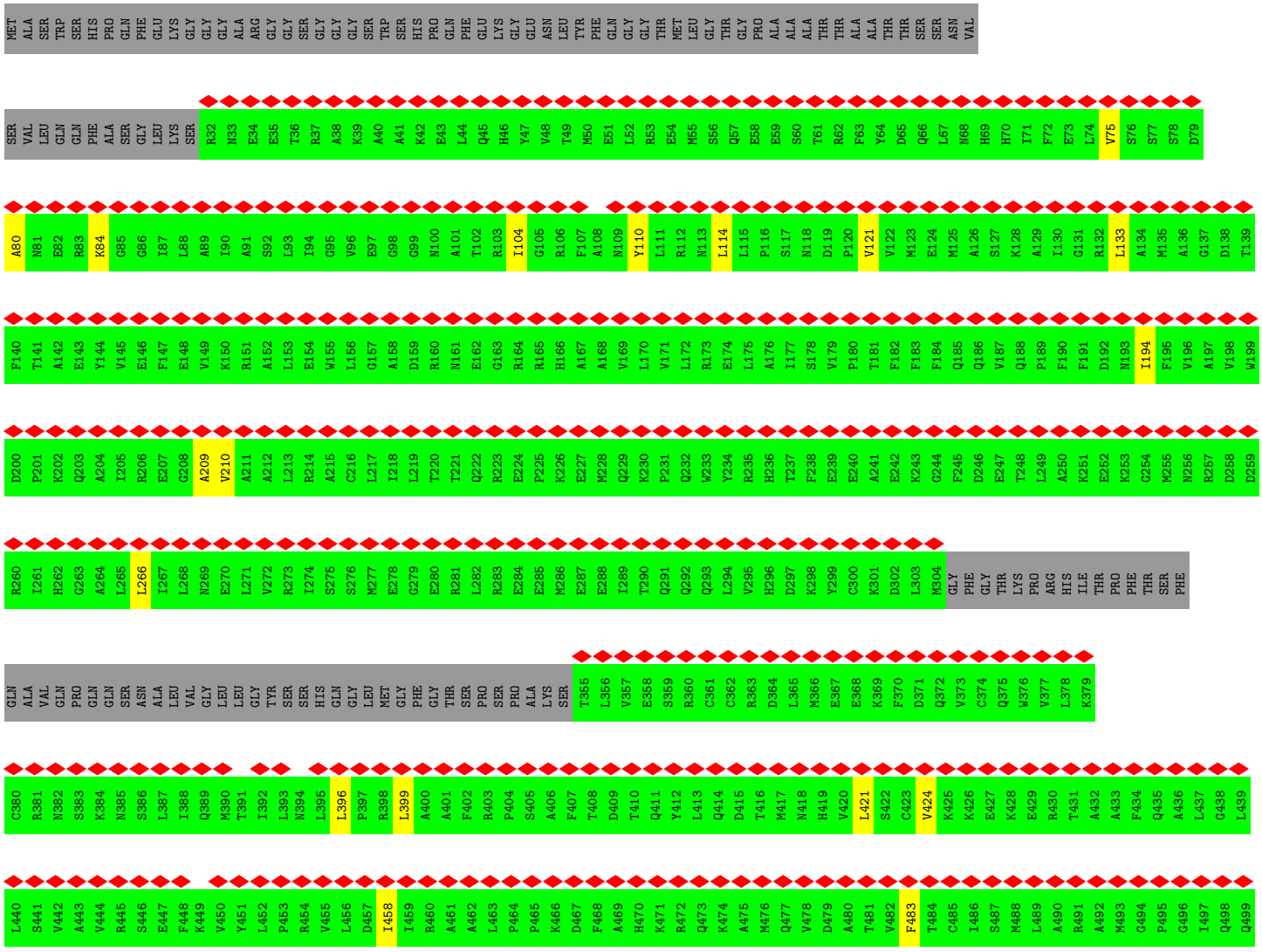
3 Residue-property plots (i)

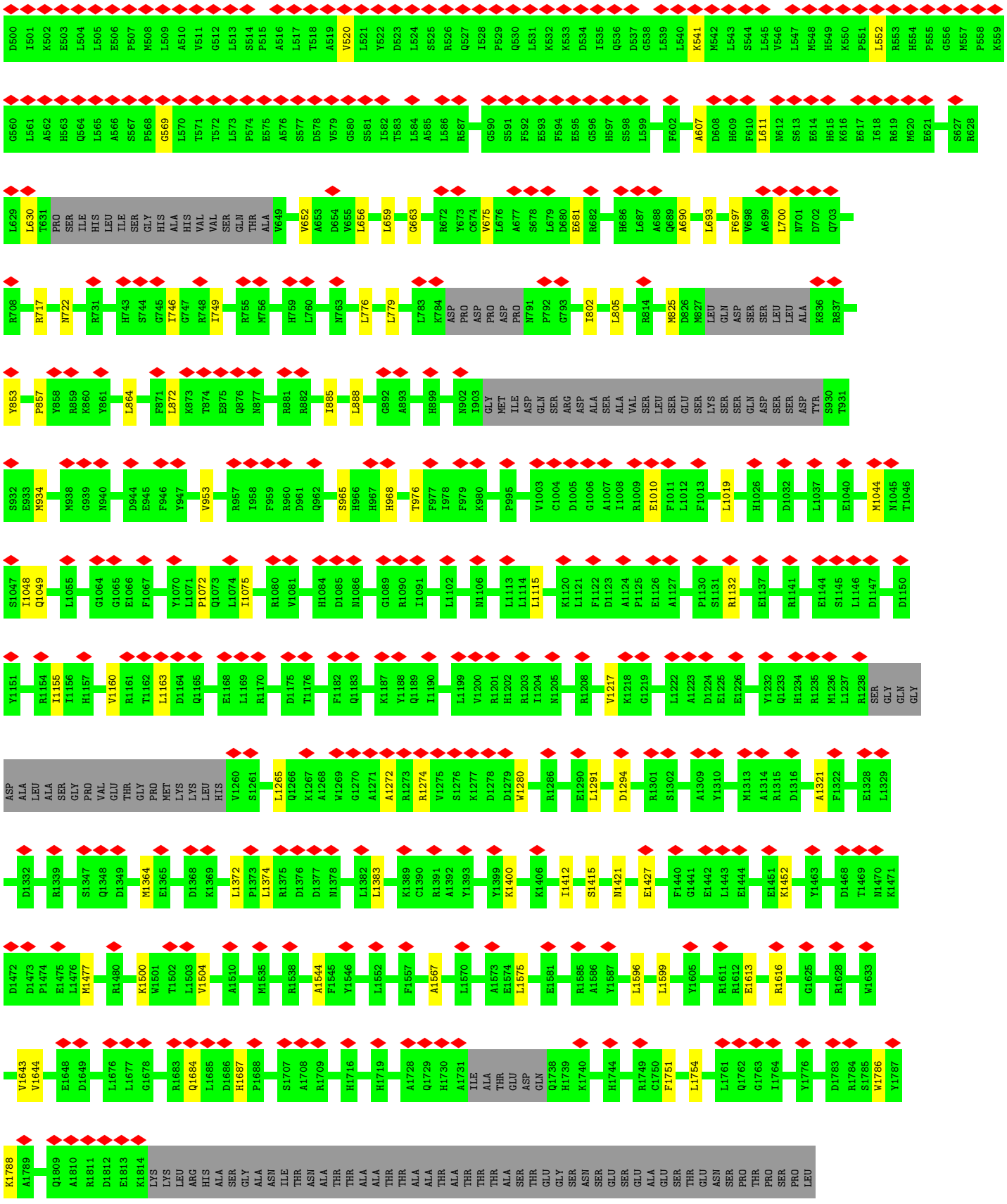
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

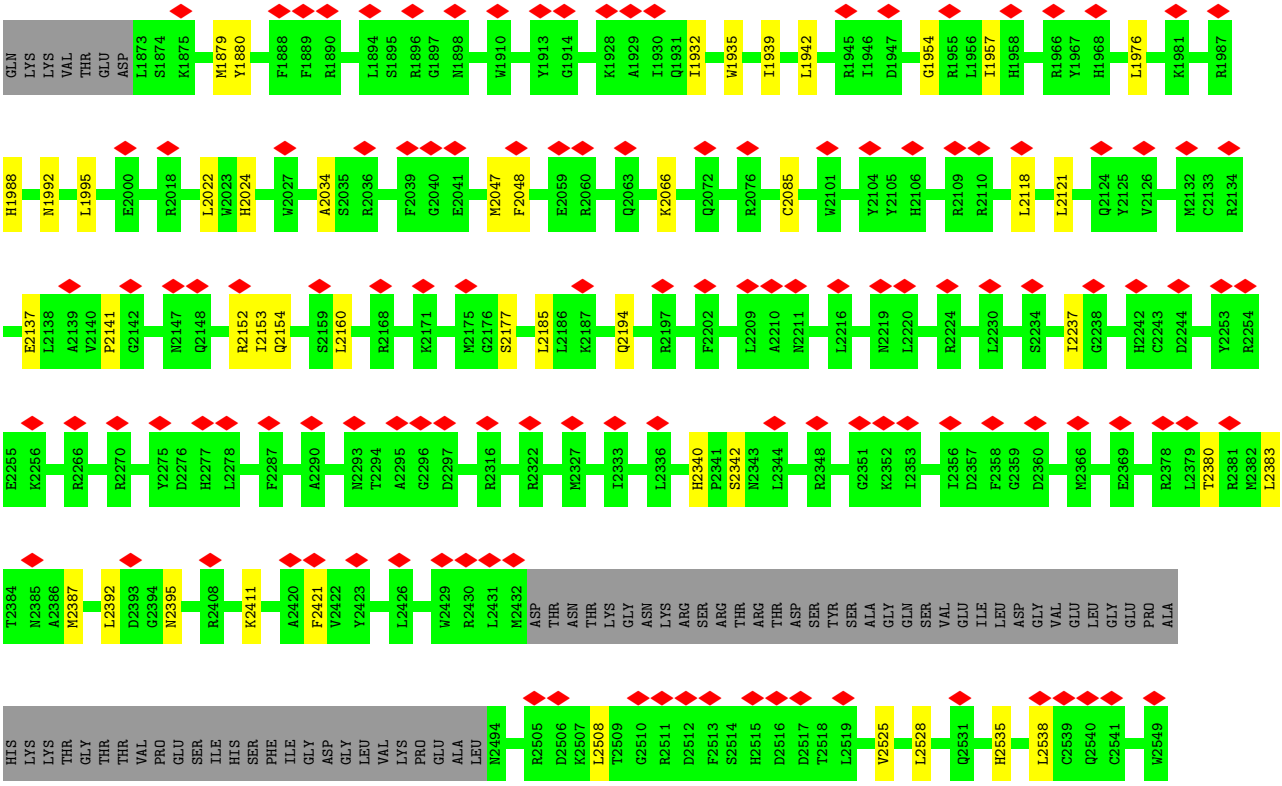
- Molecule 1: Serine/threonine-protein kinase mTOR

Chain A:



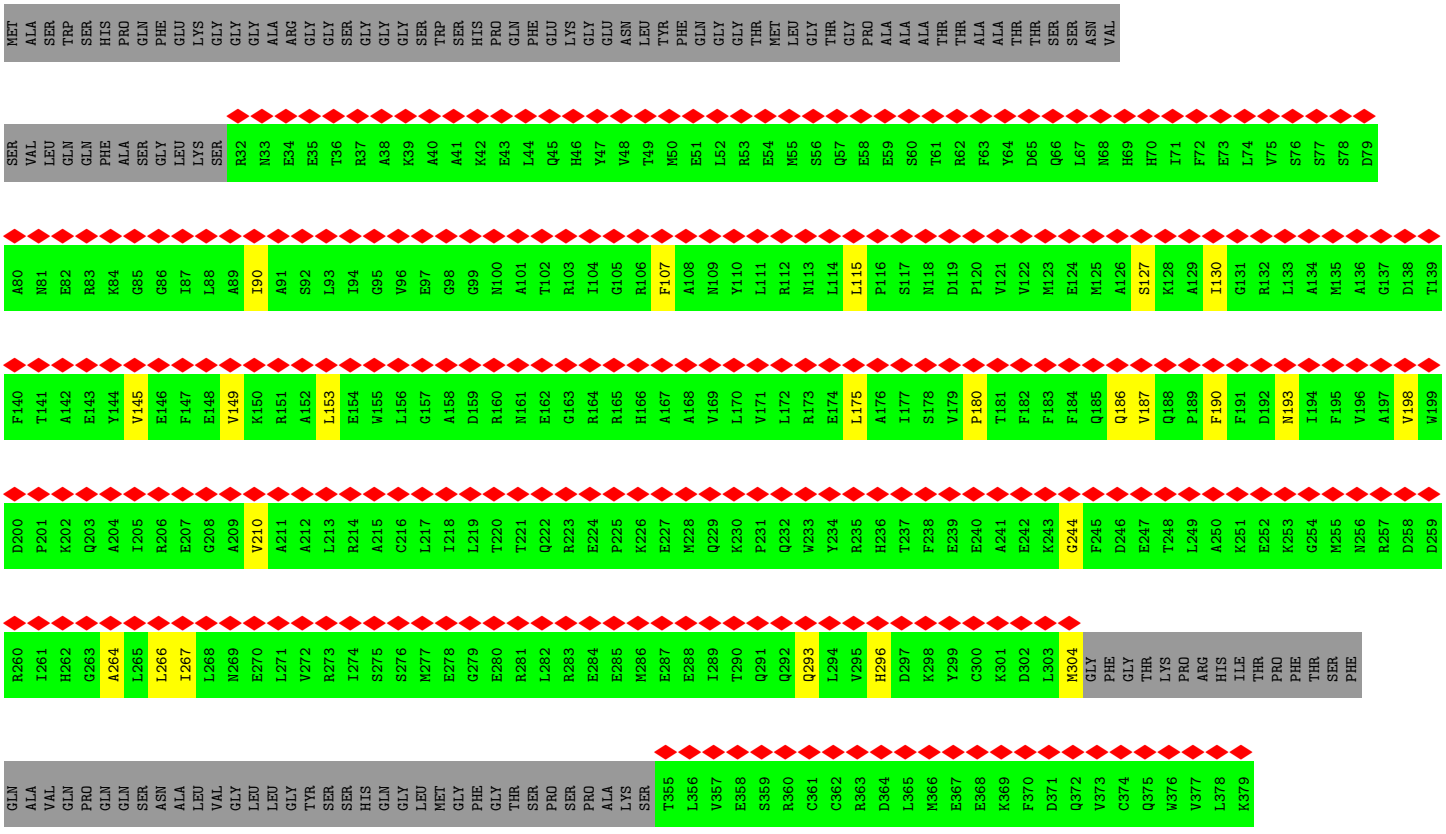


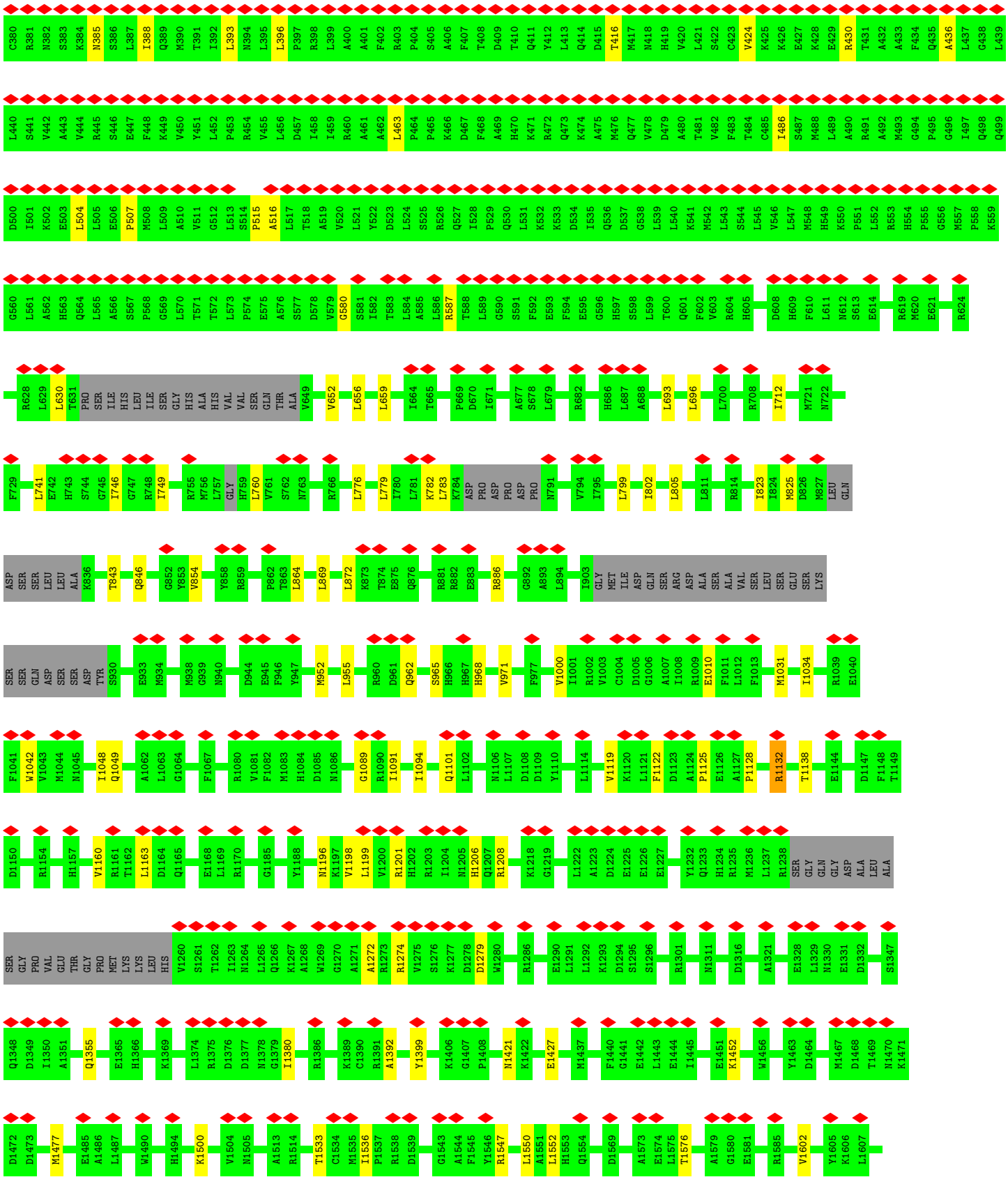

D500 I501 K502 E503 L504 L505 E506 P507 M508 L509 A510 V511 G512 L513 S514 P515 A516 L517 T518 A519 V520 L521 Y522 D523 L524 S525 R526 Q527 I528 P529 Q530 L531 K532 K533 D534 I535 Q536 D537 G538 L539 L540 K541 M542 L543 S544 L545 V546 L547 M548 H549 K550 P551 L552 R553 H554 P555 G556 M557 P558 K559
G560 L561 A562 H563 Q564 L565 A566 S567 P568 G569 L570 T571 T572 L573 P574 E575 A576 S577 D578 V579 G580 S581 I582 T583 L584 A585 L586 R587 G590 S591 F592 E593 F594 E595 G596 H597 S598 L599 F602 A607 D608 H609 F610 L611 N612 S613 E614 H615 K616 E617 I618 R619 M620 E621 S627 R628
L629 L630 T631 PRO SER ILE HIS LEU ILE SER GLY HIS ALA HIS VAL VAL SER GLN THR ALA V649 V652 A653 D654 V655 L656 L659 G663 R672 Y673 C674 V675 L676 A677 S678 L679 D680 E681 R682 H686 L687 A688 Q689 A690 L693 F697 V698 A699 L700 N701 D702 Q703
R708 R717 N722 R731 H743 S744 G745 I746 G747 R748 I749 R755 M756 H759 L760 N763 L776 L779 L783 K784 ASP PRO ASP PRO ASP PRO N791 P792 G793 I802 L805 R814 M825 D826 M827 LEU GLN ASP SER SER LEU LEU ALA K836 R837
Y853 P857 Y858 R859 K860 Y861 L864 F871 L872 K873 T874 E875 Q876 N877 R881 R882 I885 L888 G892 A893 H899 N902 I903 GLY MET ILE ASP GLN SER ARG ASP ALA SER ALA VAL SER LEU SER GLU SER LYS SER SER GLN ASP SER SER ASP TYR S930 T931
S932 E933 M934 M938 G939 N940 D944 E945 F946 Y947 V953 R957 I958 F959 R960 D961 Q962 S965 H966 H967 H968 T976 F977 I978 F979 K980 P995 V1003 C1004 D1005 G1006 A1007 I1008 R1009 E1010 F1011 L1012 F1013 L1019 H1026 D1032 L1037 E1040 M1044 N1045 T1046
S1047 I1048 Q1049 L1055 G1064 G1065 E1066 F1067 Y1070 L1071 P1072 Q1073 L1074 I1075 R1080 V1081 H1084 D1085 N1086 G1089 R1090 I1091 L1102 M1106 L1113 L1114 L1115 K1120 L1121 F1122 D1123 A1124 P1125 E1126 A1127 P1130 S1131 R1132 E1137 R1141 E1144 S1145 L1146 D1147 D1150
Y1151 R1154 I1155 I1156 H1157 V1160 R1161 T1162 L1163 D1164 Q1165 E1168 L1169 R1170 D1175 T1176 F1182 Q1183 K1187 Y1188 Q1189 I1190 L1199 V1200 R1201 H1202 R1203 I1204 N1205 R1208 V1217 K1218 G1219 L1222 A1223 D1224 E1225 E1226 Y1232 Q1233 H1234 R1235 M1236 L1237 R1238 SER GLY GLN GLY
ASP ALA LEU ALA SER GLY PRO VAL GLU THR GLY PRO MET LYS LYS LEU HIS V1260 S1261 L1265 Q1266 K1267 A1268 W1269 G1270 A1271 A1272 R1273 R1274 V1275 S1276 K1277 D1278 D1279 W1280 R1286 E1290 L1291 D1294 R1301 S1302 A1309 Y1310 M1313 A1314 R1315 D1316 A1321 F1322 E1328 L1329
D1332 R1339 S1347 Q1348 D1349 M1364 E1365 D1368 K1369 L1372 P1373 L1374 R1375 D1376 D1377 N1378 L1382 L1383 K1389 C1390 R1391 A1392 Y1393 Y1399 K1400 K1406 I1412 S1415 N1421 E1427 F1440 G1441 E1442 L1443 E1444 E1451 K1452 Y1463 D1468 T1469 N1470 K1471
D1472 D1473 P1474 E1475 L1476 M1477 R1480 K1500 W1501 T1502 L1503 V1504 A1510 M1535 R1538 A1544 F1545 Y1546 L1552 F1557 A1567 L1570 A1573 E1574 L1575 E1581 R1585 A1586 Y1587 L1596 L1599 Y1605 R1611 R1612 E1613 R1616 G1625 R1628 W1633
V1643 V1644 E1648 D1649 L1676 L1677 G1678 R1683 Q1684 L1685 D1686 H1687 P1688 S1707 A1708 R1709 H1716 H1719 A1728 Q1729 H1730 A1731 ILE ALA THR GLU ASP GLN Q1738 H1739 K1740 H1744 R1749 C1750 F1751 L1754 L1761 Q1762 G1763 I1764 Y1776 D1783 R1784 S1785 W1786 Y1787
K1788 A1789 Q1809 A1810 R1811 D1812 E1813 K1814 LYS LYS LEU ARG HIS ALA SER GLY ALA ASN ILE THR ASN ALA THR THR ALA ALA THR THR ALA ALA THR THR ALA ALA THR THR THR ALA SER THR GLU GLY SER ASN SER GLU SER GLU ALA GLU SER THR GLU ASN SER PRO THR PRO SER PRO LEU

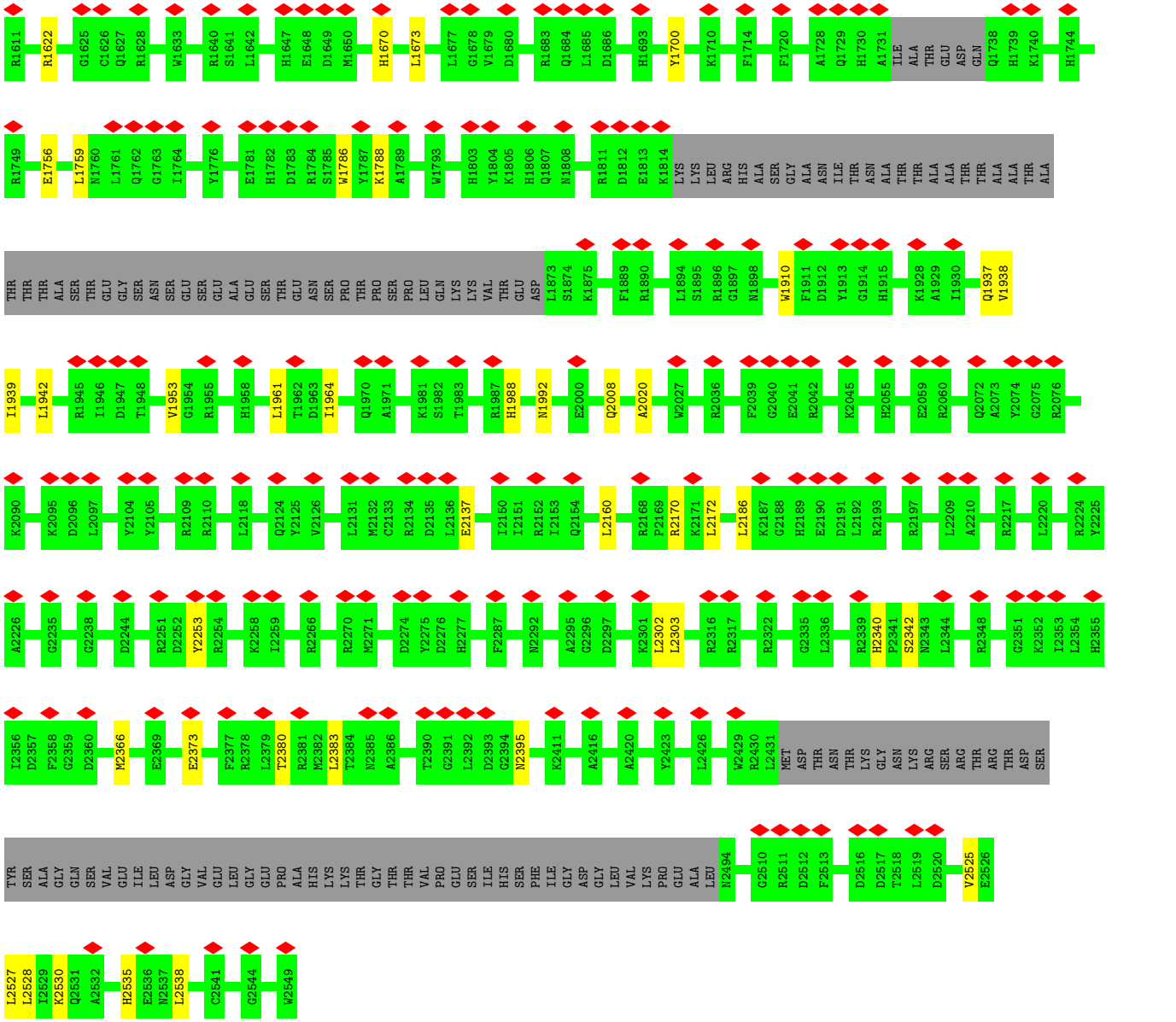


• Molecule 1: Serine/threonine-protein kinase mTOR

Chain B:

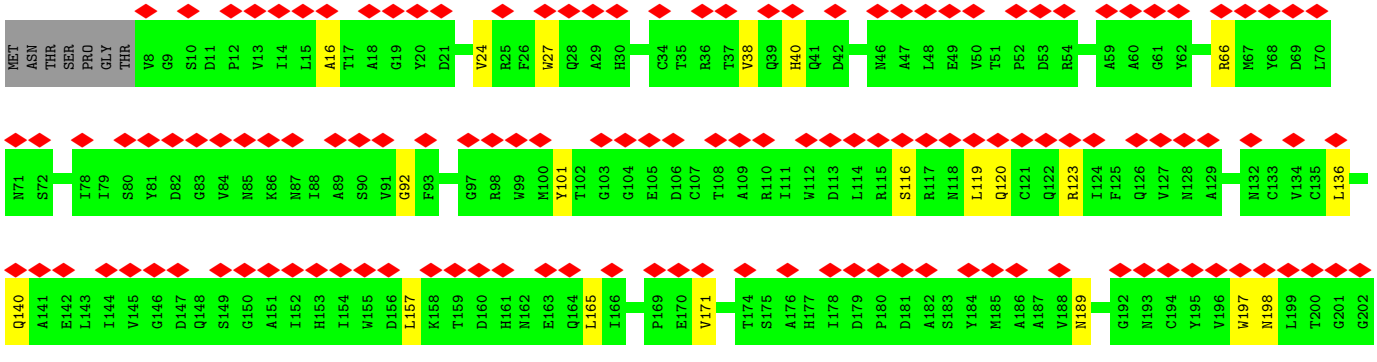


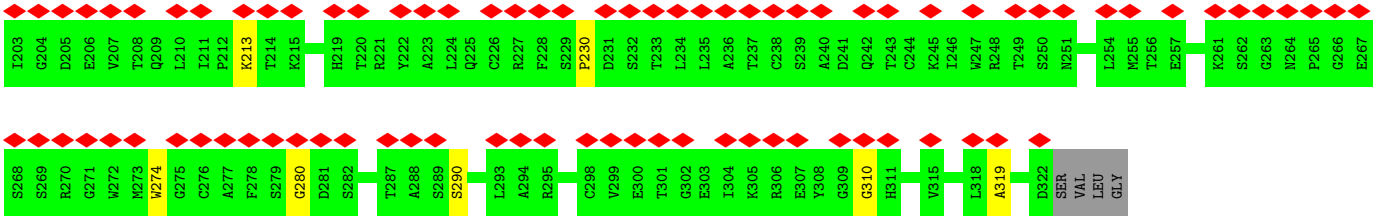

C380 R381 N382 S383 K384 N385 S386 L387 I388 Q389 M390 T391 I392 L393 N394 L395 L396 P397 R398 L399 A400 A401 F402 R403 P404 S405 A406 F407 T408 D409 T410 Q411 Y412 L413 Q414 D415 T416 M417 N418 H419 V420 L421 S422 C423 V424 K425 K426 E427 K428 E429 R430 T431 A432 A433 F434 Q435 A436 L437 G438 L439
L440 S441 V442 A443 V444 R445 S446 E447 F448 K449 V450 Y451 L452 P453 R454 V455 L456 D457 I458 I459 R460 A461 A462 L463 P464 P465 K466 D467 F468 A469 H470 K471 R472 Q473 K474 A475 M476 Q477 V478 D479 A480 T481 V482 F483 T484 C485 I486 S487 M488 L489 A490 R491 A492 M493 G494 P495 G496 I497 Q498 Q499
D500 I501 K502 E503 L504 L505 E506 P507 M508 L509 A510 V511 G512 L513 S514 P515 A516 L517 T518 A519 V520 L521 Y522 D523 L524 S525 R526 Q527 I528 P529 Q530 L531 K532 K533 D534 I535 Q536 D537 G538 L539 L540 K541 M542 L543 S544 L545 V546 L547 M548 H549 K550 P551 L552 R553 H554 P555 G556 M557 P558 K559
G560 L561 A562 H563 Q564 L565 A566 S567 P568 G569 L570 T571 T572 L573 P574 E575 A576 S577 D578 V579 G580 S581 I582 T583 L584 A585 L586 R587 T588 L589 G590 S591 F592 E593 F594 E595 G596 H597 S598 L599 T600 Q601 F602 V603 R604 H605 D608 H609 F610 L611 N612 S613 E614 R619 M620 E621 R624
R628 L629 L630 T631 PRO SER ILE HIS LEU ILE SER GLY HIS ALA HIS VAL VAL SER GLN THR ALA V649 V652 L656 L659 I664 T665 P669 D670 I671 A677 S678 L679 R682 H686 L687 A688 L693 L696 L700 R708 I712 M721 N722
F729 L741 E742 H743 S744 G745 I746 G747 R748 I749 R755 M756 L757 GLY H759 L760 V761 S762 N763 R766 L776 L779 I780 L781 K782 L783 K784 ASP PRO ASP PRO ASP PRO N791 V794 I795 L799 I802 L805 L811 R814 I823 I824 M825 D826 M827 LEU GLN
ASP SER SER LEU LEU ALA K836 T843 Q846 G852 Y853 V854 Y858 R859 P862 T863 L864 L869 L872 K873 T874 E875 Q876 R881 R882 E883 R886 G892 A893 L894 I903 GLY MET ILE ASP GLN SER ARG ASP ALA SER ALA VAL SER LEU SER GLU SER LYS
SER SER GLN ASP SER SER ASP TYR S930 E933 M934 M938 G939 N940 D944 E945 F946 Y947 M952 L955 R960 D961 Q962 S965 H966 H967 H968 V971 F977 V1000 I1001 R1002 V1003 C1004 D1006 G1006 A1007 I1008 R1009 E1010 F1011 L1012 F1013 M1031 I1034 R1039 E1040
F1041 W1042 V1043 M1044 N1045 I1048 Q1049 A1062 L1063 G1064 F1067 R1080 V1081 F1082 M1083 H1084 D1085 N1086 G1089 R1090 I1091 I1094 Q1101 L1102 N1106 L1107 D1108 D1109 Y1110 L1114 V1119 K1120 L1121 F1122 D1123 A1124 P1125 E1126 A1127 P1128 R1132 T1138 E1144 D1147 F1148 T1149
D1150 R1154 H1157 V1160 R1161 T1162 L1163 D1164 Q1165 E1168 L1169 R1170 G1185 Y1188 N1196 K1197 V1198 L1199 V1200 R1201 H1202 R1203 I1204 N1205 H1206 Q1207 R1208 K1218 G1219 L1222 A1223 D1224 E1225 E1226 E1227 Y1232 Q1233 H1234 R1235 M1236 L1237 R1238 SER GLY GLN GLY ASP ALA LEU ALA
SER GLY PRO VAL GLU THR GLY PRO MET LYS LYS LEU HIS V1260 S1261 T1262 I1263 N1264 L1265 Q1266 K1267 A1268 W1269 G1270 A1271 A1272 R1273 R1274 V1275 S1276 K1277 D1278 D1279 W1280 R1286 E1290 L1291 L1292 K1293 D1294 S1295 S1296 R1301 N1311 D1316 A1321 E1328 L1329 N1330 E1331 D1332 S1347
Q1348 D1349 I1350 A1351 Q1355 E1365 H1366 K1369 L1374 R1375 D1376 D1377 N1378 G1379 I1380 R1386 K1389 C1390 R1391 A1392 Y1399 K1406 G1407 P1408 N1421 K1422 E1427 M1437 F1440 G1441 E1442 L1443 E1444 I1445 E1451 K1452 W1456 Y1463 D1464 M1467 D1468 T1469 N1470 K1471
D1472 D1473 M1477 E1485 A1486 L1487 W1490 H1494 K1500 V1504 N1505 A1513 R1514 T1533 C1534 M1535 I1536 P1537 R1538 D1539 G1543 A1544 F1545 Y1546 R1547 L1550 A1551 L1552 H1553 Q1554 D1569 A1573 E1574 L1575 T1576 A1579 G1580 E1581 R1585 V1602 Y1605 K1606 L1607



• Molecule 2: Target of rapamycin complex subunit LST8

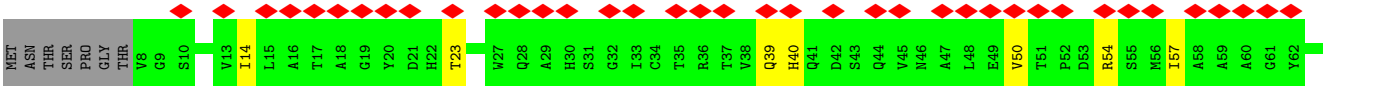
Chain C:

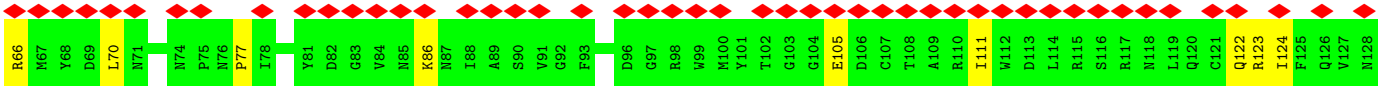


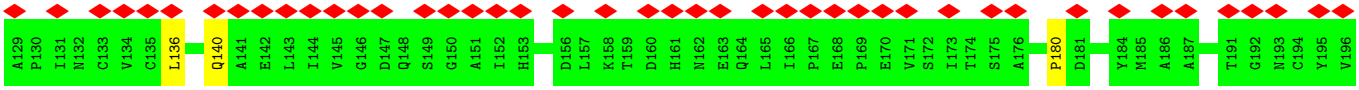


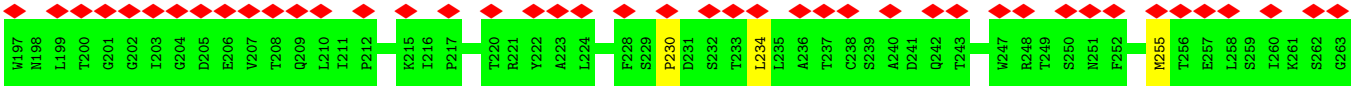
• Molecule 2: Target of rapamycin complex subunit LST8

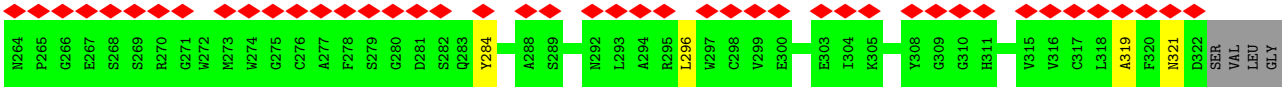
Chain D:





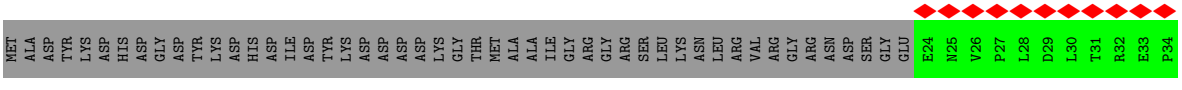


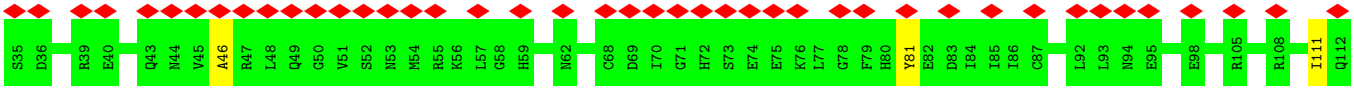


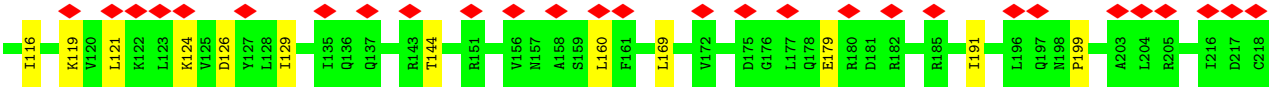


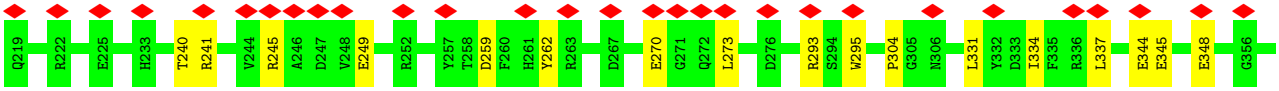
• Molecule 3: Rapamycin-insensitive companion of mTOR

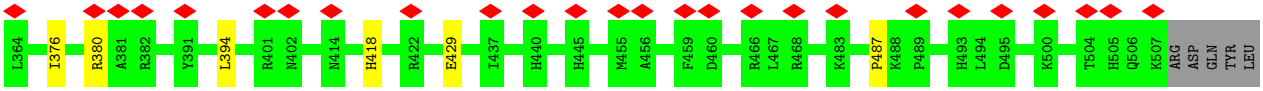
Chain E:

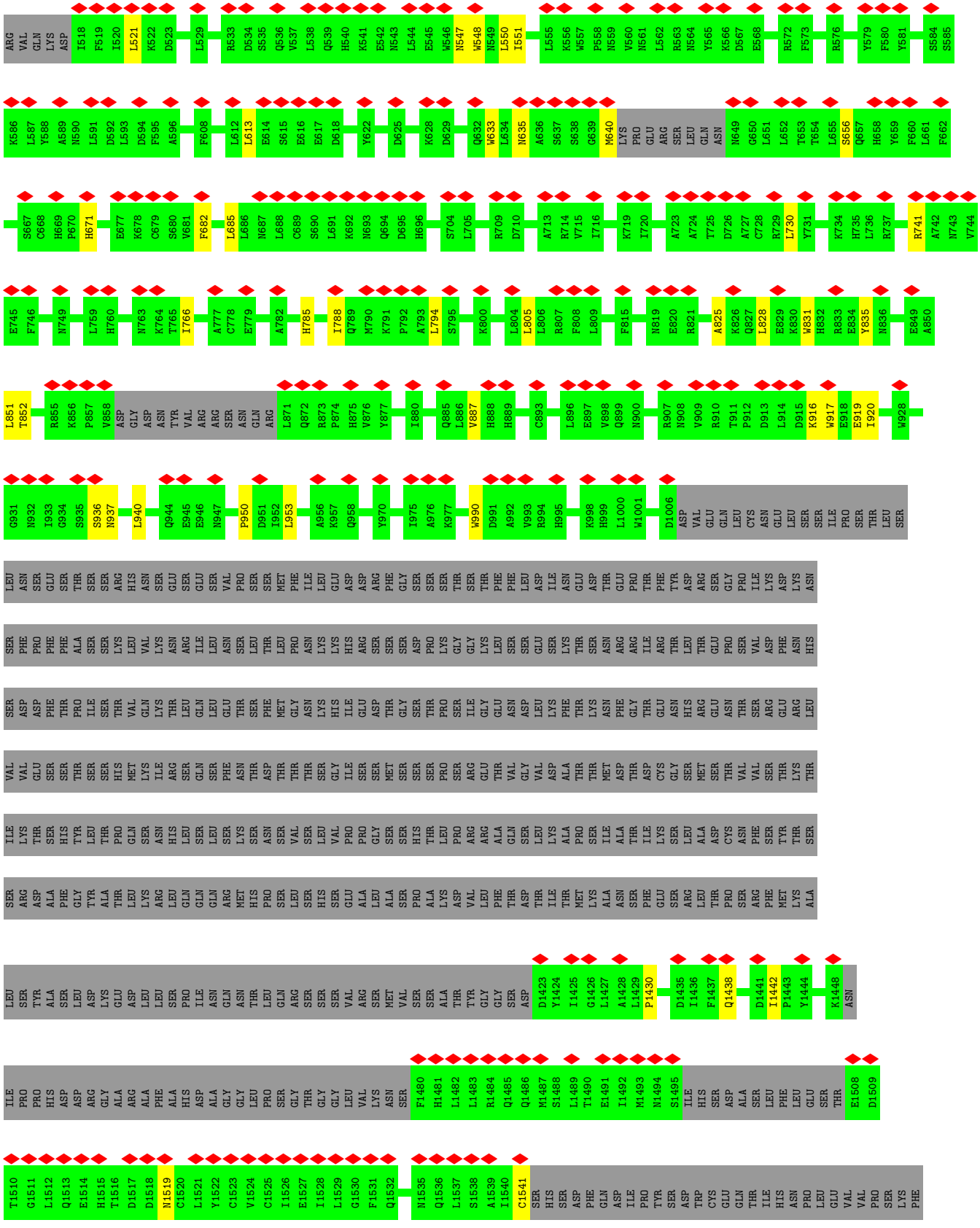








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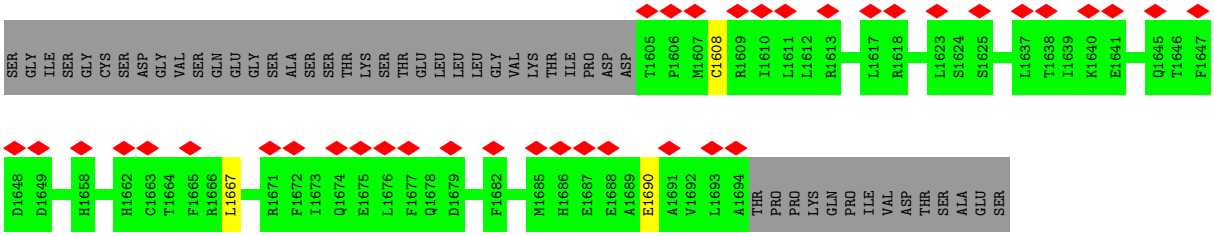
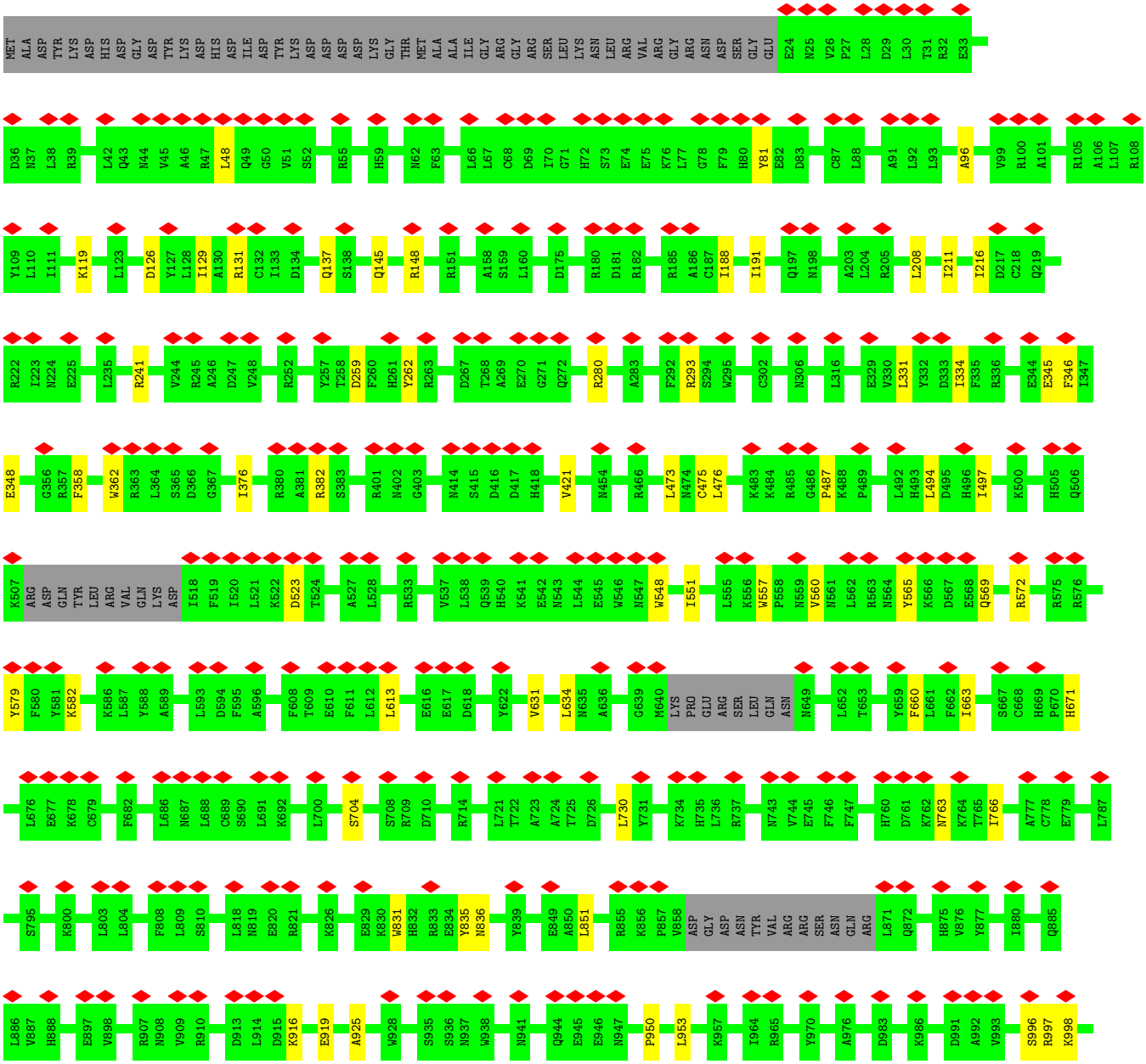
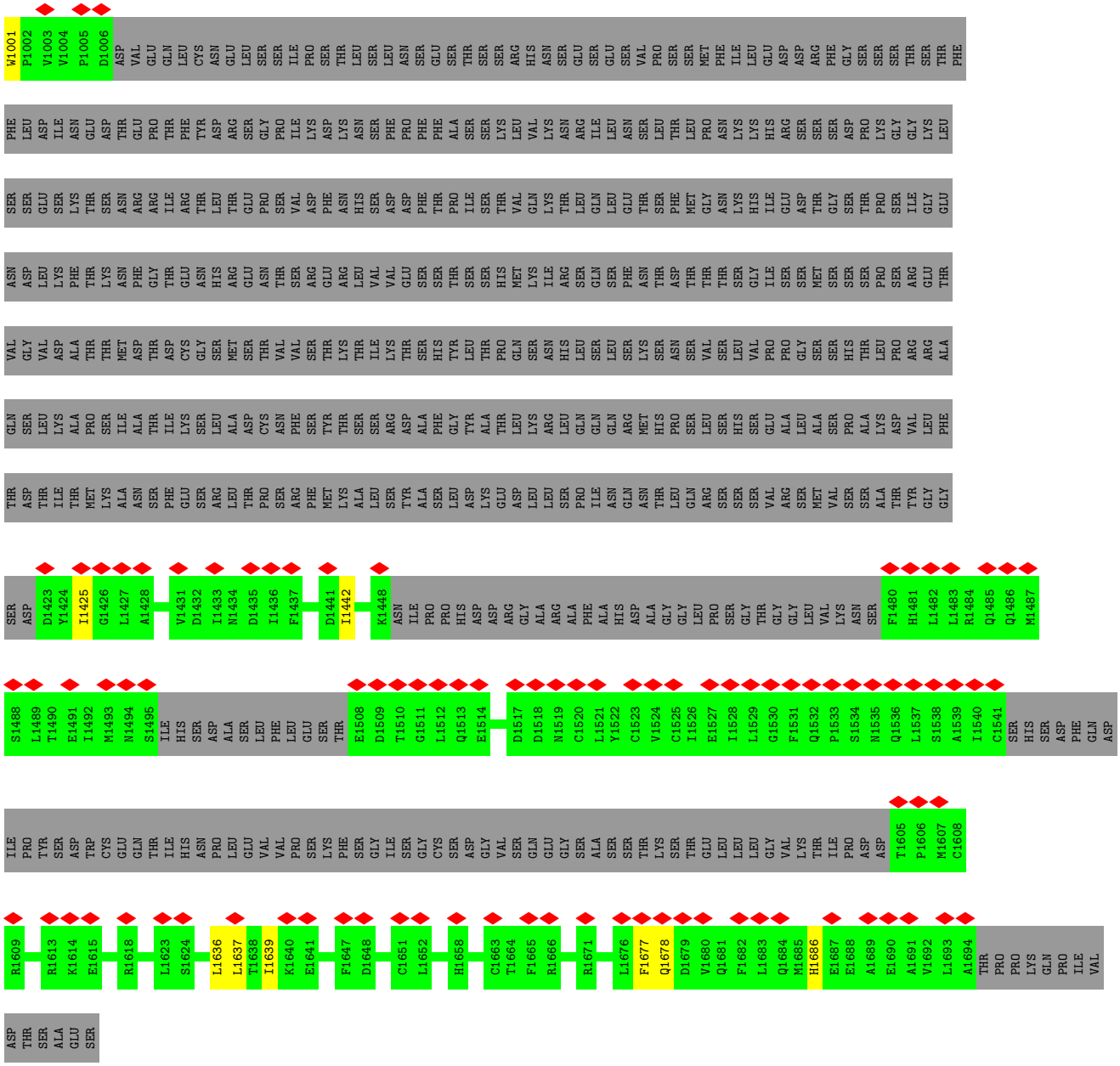
K586 L587 Y588 A589 N590 L591 D592 L593 D594 F595 A596 F608 L612 L613 E614 S615 E616 E617 D618 Y622 D625 K628 D629 Q632 W633 L634 N635 A636 S637 S638 G639 M640 LYS PRO GLU ARG SER LEU GLN ASN N649 G650 L651 L652 T653 T654 L655 S656 Q657 H658 Y659 F660 L661 F662
S667 C668 H669 P670 H671 E677 K678 C679 S680 V681 F682 L685 L686 N687 L688 C689 S690 L691 K692 N693 Q694 D695 H696 S704 L705 R709 D710 A713 R714 V715 I716 K719 I720 A723 A724 T725 D726 A727 C728 R729 L730 Y731 K734 H735 L736 R737 R741 A742 N743 V744
E745 F746 N749 L759 H760 N763 K764 T765 I766 A777 C778 E779 A782 H785 I788 Q789 M790 K791 P792 A793 L794 S795 K800 L804 L805 L806 R807 F808 L809 F815 N819 E820 R821 A825 K826 Q827 L828 E829 K830 W831 H832 R833 E834 Y835 N836 E849 A850
L851 T852 R855 K856 P857 V858 ASP GLY ASP ASN TYR VAL ARG ARG SER ASN GLN ARG L871 Q872 R873 P874 H875 V876 Y877 I880 Q885 L886 V887 H888 H889 C893 L896 E897 V898 Q899 N900 R907 N908 V909 R910 T911 P912 D913 L914 D915 K916 W917 E918 E919 I920 W928
G931 N932 I933 G934 S935 S936 N937 L940 Q944 E945 E946 N947 P950 D951 I952 L953 A956 K957 Q958 Y970 I975 A976 K977 W990 D991 A992 V993 R994 H995 K998 H999 L1000 W1001 D1006 ASP VAL GLU GLN LEU CYS ASN GLU LEU SER SER ILE PRO SER THR LEU SER
LEU ASN SER GLU SER THR SER SER SER ARG HIS ASN SER GLU SER GLU SER VAL PRO SER SER MET PHE PHE LEU GLU ASP ASP ARG PHE GLY SER SER SER THR SER THR PHE PHE PHE LEU ASP ILE ILE ASN GLU ASP THR GLU PRO PRO THR PHE TYR ASP ARG SER GLY PRO ILE LYS ASP LYS ASN
SER PHE PRO PHE PHE ALA SER SER SER LYS LEU VAL VAL LYS ASN ARG ILE LEU ASN SER LEU THR THR LEU PRO ASN LYS LYS HIS ARG SER SER SER SER ASP PRO PRO LYS GLY GLY LYS LYS LEU SER SER SER GLU SER LYS THR SER ASN ARG ARG ILE ARG THR LEU THR GLU PRO SER VAL ASP PHE ASN HIS
SER ASP ASP PHE THR PRO ILE SER THR VAL GLN GLN LYS THR LEU GLN LEU GLU GLU THR SER PHE MET GLY ASN LYS HIS ILE GLU ASP THR GLY SER THR PRO SER ILE GLY GLU ASN ASP LEU LYS PHE THR LYS ASN PHE GLY THR GLU ASN HIS ARG GLU ASN THR SER ARG GLU ARG LEU
VAL VAL GLU SER SER THR SER SER HIS MET LYS ILE ARG SER GLN SER PHE ASN THR ASP THR THR THR SER GLY ILE SER SER MET SER SER SER SER PRO SER ARG GLU THR VAL GLY VAL ASP ALA THR THR MET ASP THR ASP CYS GLY SER LEU SER ASP PHE SER TYR THR THR LYS
ILE LYS THR SER HIS TYR LEU THR PRO GLN SER ASN HIS LEU SER LEU SER LYS SER ASN SER LEU VAL PRO PRO GLY SER SER SER HIS THR LEU PRO ARG ARG ALA GLN SER LEU LYS ALA THR ILE LYS SER LEU ALA ASP CYS ASN PHE SER TYR THR SER
SER ARG ASP ALA PHE GLY TYR ALA THR LEU LYS ARG LEU GLN GLN GLN ARG MET HIS PRO SER LEU SER HIS SER GLU ALA LEU ALA ALA SER PRO ALA LYS ASP VAL LEU PHE THR ASP THR ILE THR MET LYS ALA ASN SER PHE GLU SER ARG LEU THR PRO VAL SER ARG PHE MET LYS ALA
LEU SER TYR ALA SER LEU ASP LYS GLU ASP LEU LEU LEU SER PRO ILE ASN GLN ASN THR LEU GLN ARG SER SER SER VAL ARG SER MET VAL SER SER ALA THR TYR GLY GLY SER ASP D1423 Y1424 I1425 G1426 L1427 A1428 L1429 P1430 D1435 I1436 F1437 Q1438 D1441 I1442 P1443 Y1444 K1448 ASN
ILE PRO PRO HIS ASP ASP ARG GLY ALA ARG ALA PHE GLY ALA GLY GLY LEU PRO SER GLY THR GLY GLY LEU VAL LYS ASN SER F1480 H1481 L1482 L1483 R1484 Q1485 Q1486 M1487 S1488 L1489 T1490 E1491 I1492 M1493 N1494 S1495 ILE HIS SER ASP ALA SER LEU PHE LEU GLU SER THR E1508 D1509
T1510 G1511 L1512 Q1513 E1514 H1515 T1516 D1517 D1518 N1519 C1520 L1521 Y1522 C1523 V1524 C1525 I1526 E1527 I1528 L1529 G1530 F1531 Q1532 N1535 Q1536 L1537 S1538 A1539 I1540 C1541 SER HIS SER ASP PHE GLN ASP ILE PRO TYR SER ASP TRP CYS GLU GLN THR ILE HIS ASN PRO LEU GLU VAL VAL PRO SER LYS PHE



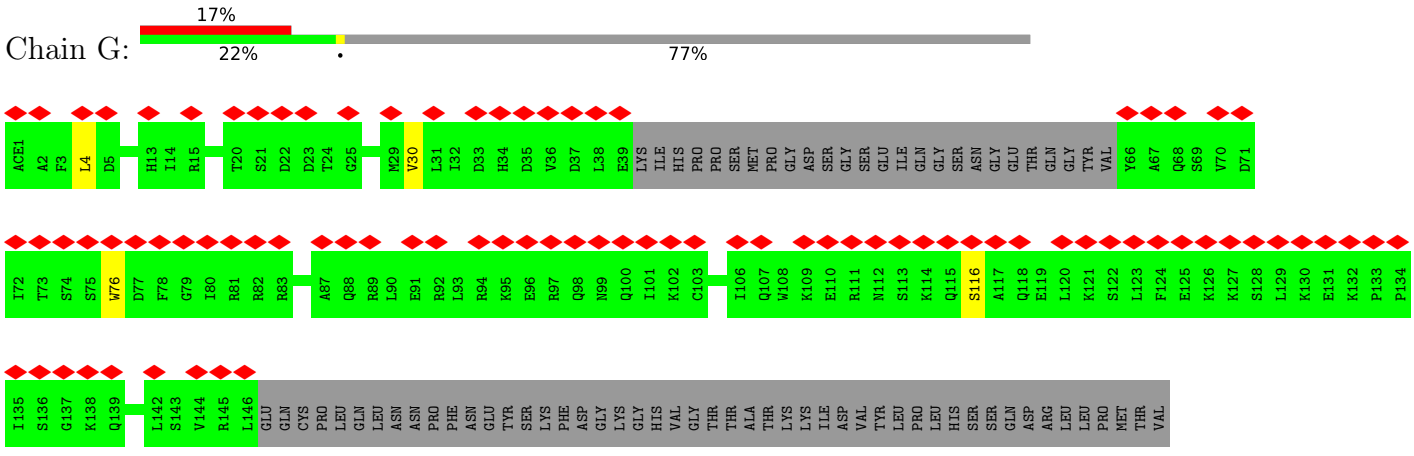
• Molecule 3: Rapamycin-insensitive companion of mTOR

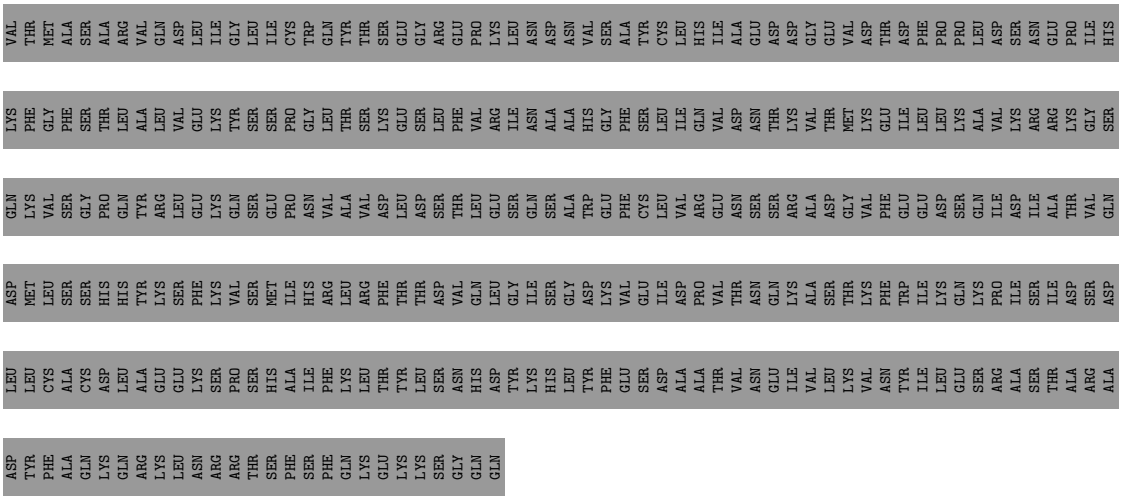
Chain F:





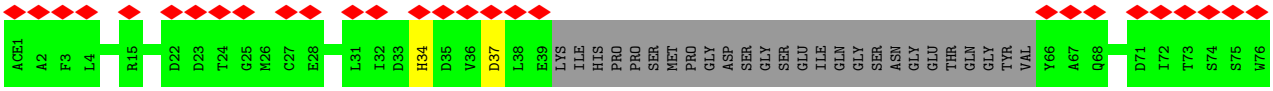
• Molecule 4: Target of rapamycin complex 2 subunit MAPKAP1

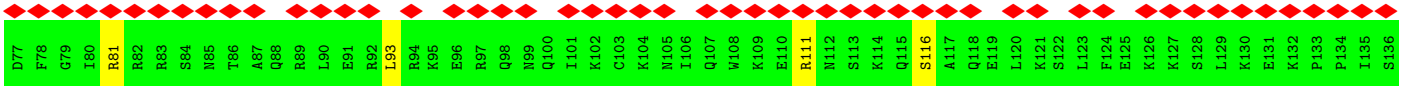


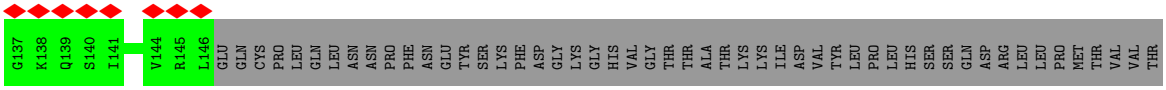


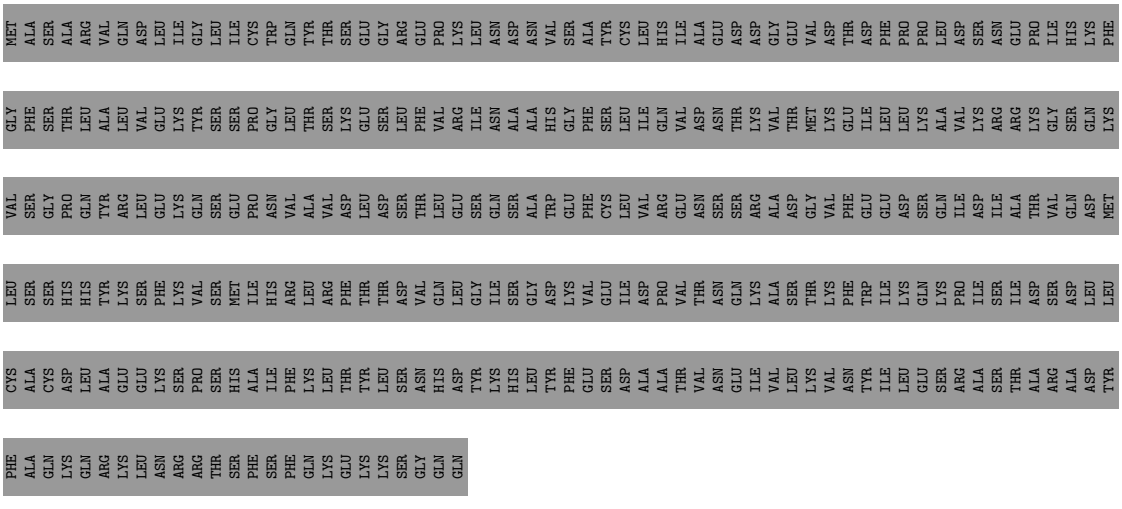
• Molecule 4: Target of rapamycin complex 2 subunit MAPKAP1

Chain H:









4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SUBTOMOGRAM AVERAGING	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of subtomograms used	38469	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/Å^2$)	140	Depositor
Minimum defocus (nm)	3000	Depositor
Maximum defocus (nm)	5000	Depositor
Magnification	81000	Depositor
Image detector	TFS FALCON 4i (4k x 4k)	Depositor
Maximum map value	0.030	Depositor
Minimum map value	-0.013	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.001	Depositor
Recommended contour level	0.01	Depositor
Map size (Å)	532.92804, 532.92804, 532.92804	wwPDB
Map dimensions	352, 352, 352	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.514, 1.514, 1.514	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: ZN, ACE

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#$\|Z\|$ >5	RMSZ	#$\|Z\|$ >5
1	A	0.35	0/18617	0.79	0/25184
1	B	0.35	0/18604	0.81	0/25166
2	C	0.35	0/2501	0.78	0/3408
2	D	0.34	0/2501	0.79	0/3408
3	E	0.34	0/9154	0.77	0/12384
3	F	0.34	0/9154	0.79	0/12384
4	G	0.32	0/984	0.81	0/1318
4	H	0.31	0/984	0.83	0/1318
All	All	0.34	0/62499	0.80	0/84570

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1
1	B	0	1
All	All	0	2

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	1132	ARG	Sidechain
1	B	1132	ARG	Sidechain

5.2 Too-close contacts (i)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	18242	0	18471	80	0
1	B	18230	0	18458	84	0
2	C	2443	0	2327	15	0
2	D	2443	0	2327	15	0
3	E	8990	0	9187	43	0
3	F	8990	0	9187	44	0
4	G	974	0	993	4	0
4	H	974	0	993	4	0
5	E	1	0	0	0	0
5	F	1	0	0	0	0
All	All	61288	0	61943	282	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 2.

All (282) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:153:LEU:HD22	1:B:193:ASN:HB2	1.78	0.66
2:D:50:VAL:HG21	2:D:321:ASN:HB2	1.80	0.64
1:A:722:ASN:HD21	3:F:1001:TRP:HB3	1.63	0.62
1:A:2022:LEU:HD13	1:A:2066:LYS:HE2	1.82	0.60
3:E:1541:CYS:HA	3:E:1608:CYS:HB2	1.83	0.60
1:A:2185:LEU:HB2	1:A:2237:ILE:HB	1.84	0.60
3:F:345:GLU:HG2	3:F:348:GLU:H	1.67	0.59
1:B:1160:VAL:HA	1:B:1163:LEU:HD12	1.85	0.58
1:B:783:LEU:HD23	1:B:823:ILE:HD13	1.86	0.58
1:B:210:VAL:HG21	1:B:266:LEU:HB3	1.84	0.57
3:F:208:LEU:HA	3:F:211:ILE:HD12	1.87	0.57
1:A:1115:LEU:HD21	1:A:1155:ILE:HD11	1.87	0.57
3:F:145:GLN:HE22	3:F:148:ARG:HH11	1.53	0.57
3:E:46:ALA:HB1	3:E:1690:GLU:HG2	1.86	0.56
3:F:950:PRO:HA	3:F:953:LEU:HD12	1.87	0.56
3:F:293:ARG:HD2	3:F:851:LEU:HD22	1.88	0.56
1:A:2535:HIS:HA	1:A:2538:LEU:HD12	1.88	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:1427:GLU:HG2	1:B:2395:ASN:HA	1.88	0.56
1:B:962:GLN:HE22	1:B:1000:VAL:HG13	1.71	0.56
1:B:2535:HIS:HA	1:B:2538:LEU:HD12	1.87	0.55
1:A:934:MET:HG2	1:A:953:VAL:HG21	1.89	0.55
3:E:730:LEU:HD13	3:E:766:ILE:HG12	1.88	0.55
1:A:424:VAL:HG11	1:A:458:ILE:HG12	1.89	0.55
1:B:90:ILE:HG23	1:B:107:PHE:HB3	1.89	0.54
3:E:950:PRO:HA	3:E:953:LEU:HD12	1.89	0.54
1:A:75:VAL:HG21	1:A:110:TYR:HB3	1.90	0.54
3:F:631:VAL:HA	3:F:634:LEU:HD12	1.89	0.54
1:B:741:LEU:HG	1:B:782:LYS:HE3	1.90	0.53
3:F:831:TRP:HA	3:F:835:TYR:HB2	1.89	0.53
1:B:1274:ARG:HD3	1:B:1279:ASP:HB3	1.90	0.53
1:B:1547:ARG:HA	1:B:1550:LEU:HD12	1.91	0.53
2:D:111:ILE:HD12	2:D:123:ARG:HB3	1.91	0.53
3:E:887:VAL:HG12	3:E:936:SER:HB2	1.89	0.53
3:E:825:ALA:HA	3:E:828:LEU:HD12	1.90	0.53
3:E:916:LYS:HB2	3:E:919:GLU:HG2	1.91	0.53
3:F:126:ASP:HA	3:F:129:ILE:HD12	1.91	0.53
1:A:2121:LEU:HB2	1:A:2160:LEU:HD12	1.91	0.53
3:E:126:ASP:HA	3:E:129:ILE:HD12	1.91	0.52
1:B:869:LEU:HA	1:B:872:LEU:HD13	1.92	0.52
1:A:1596:LEU:HA	1:A:1599:LEU:HD12	1.91	0.52
3:E:345:GLU:HG2	3:E:348:GLU:H	1.74	0.52
3:E:937:ASN:HA	3:E:940:LEU:HD12	1.92	0.52
1:B:2170:ARG:HB2	1:B:2186:LEU:HB3	1.90	0.52
3:E:380:ARG:HD3	3:E:741:ARG:HA	1.92	0.52
1:A:1272:ALA:HB1	1:A:1274:ARG:HG2	1.90	0.52
1:A:1988:HIS:CE1	1:A:1992:ASN:HD21	2.28	0.52
1:B:244:GLY:HA3	1:B:264:ALA:HB2	1.92	0.52
3:F:376:ILE:HG23	3:F:487:PRO:HB2	1.90	0.52
2:C:27:TRP:HH2	2:C:310:GLY:H	1.58	0.51
1:B:2366:MET:HG2	1:B:2373:GLU:HB2	1.92	0.51
3:F:569:GLN:HG2	3:F:572:ARG:HH21	1.75	0.51
4:H:111:ARG:HD2	4:H:116:SER:HB3	1.92	0.51
1:A:656:LEU:HA	1:A:659:LEU:HD12	1.92	0.51
1:B:955:LEU:HD22	1:B:971:VAL:HG13	1.92	0.51
1:B:1939:ILE:HA	1:B:1942:LEU:HD12	1.92	0.51
1:B:2253:TYR:HB2	1:B:2302:LEU:HD13	1.92	0.51
1:A:697:PHE:HA	1:A:700:LEU:HD12	1.93	0.51
1:B:486:ILE:HG23	1:B:504:LEU:HD13	1.93	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:F:81:TYR:HD2	3:F:119:LYS:HZ2	1.59	0.51
1:A:1010:GLU:HG2	1:A:1048:ILE:HG13	1.93	0.51
3:F:494:LEU:HA	3:F:497:ILE:HD12	1.93	0.51
2:C:198:ASN:HB2	2:C:213:LYS:HD2	1.93	0.51
3:F:331:LEU:HA	3:F:334:ILE:HD12	1.92	0.51
2:C:230:PRO:HG2	2:C:280:GLY:HA2	1.94	0.50
2:D:284:TYR:HB3	2:D:296:LEU:HD11	1.92	0.50
3:E:344:GLU:HG2	3:E:418:HIS:HB3	1.93	0.50
2:C:116:SER:HB2	2:C:119:LEU:HB2	1.93	0.50
3:E:179:GLU:HG3	3:E:1667:LEU:HD23	1.94	0.50
3:F:96:ALA:HB2	4:H:81:ARG:HH22	1.75	0.50
3:F:473:LEU:HA	3:F:476:LEU:HD12	1.94	0.50
1:A:2154:GLN:HE21	1:A:2177:SER:HA	1.76	0.50
1:B:463:LEU:HD22	1:B:507:PRO:HB2	1.94	0.50
1:A:1477:MET:HE2	1:A:1500:LYS:HE2	1.94	0.50
2:D:50:VAL:HG13	2:D:319:ALA:HB1	1.93	0.50
1:B:872:LEU:HB3	1:B:1576:THR:HG22	1.94	0.50
3:E:831:TRP:HA	3:E:835:TYR:HB2	1.93	0.50
3:F:131:ARG:HH12	3:F:1677:PHE:HB2	1.77	0.50
1:A:2137:GLU:HA	1:A:2152:ARG:HD3	1.93	0.49
1:B:1988:HIS:CE1	1:B:1992:ASN:HD21	2.30	0.49
3:F:216:ILE:HG22	3:F:280:ARG:HH11	1.77	0.49
1:A:2118:LEU:HD21	1:A:2121:LEU:HD21	1.94	0.49
2:D:86:LYS:HB3	2:D:105:GLU:HB2	1.94	0.49
2:C:123:ARG:HH22	2:C:157:LEU:HA	1.77	0.49
1:A:2340:HIS:CE1	1:A:2342:SER:HB2	2.47	0.49
3:E:144:THR:HG23	4:G:30:VAL:HG22	1.93	0.49
1:B:1206:HIS:HE1	1:B:1208:ARG:HB3	1.77	0.49
1:A:194:ILE:HG13	1:A:209:ALA:HB1	1.94	0.49
3:E:259:ASP:HB3	3:E:262:TYR:HB2	1.95	0.49
1:A:2525:VAL:HA	1:A:2528:LEU:HD12	1.93	0.49
1:B:1355:GLN:HE22	1:B:1392:ALA:HB2	1.77	0.49
1:B:1380:ILE:HG23	1:B:1399:TYR:HB3	1.95	0.49
1:A:607:ALA:HA	1:A:611:LEU:HD12	1.95	0.49
1:A:1400:LYS:HE2	1:A:1415:SER:HB3	1.94	0.49
3:F:241:ARG:HD2	3:F:1442:ILE:HD12	1.94	0.49
1:A:1364:MET:HG3	1:A:1372:LEU:HB2	1.95	0.48
2:C:120:GLN:HB3	4:G:116:SER:HB2	1.95	0.48
2:D:122:GLN:HE21	2:D:124:ILE:HD11	1.77	0.48
1:A:802:ILE:HA	1:A:805:LEU:HD12	1.94	0.48
1:A:872:LEU:HD21	1:A:1575:LEU:HG	1.95	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1160:VAL:HA	1:A:1163:LEU:HD12	1.95	0.48
1:A:1291:LEU:HB3	1:A:1321:ALA:HB1	1.95	0.48
1:B:712:ILE:HD11	1:B:760:LEU:HD13	1.96	0.48
1:B:799:LEU:HG	1:B:843:THR:HG21	1.94	0.48
1:B:1091:ILE:HA	1:B:1094:ILE:HD12	1.96	0.48
1:B:1937:GLN:HG3	1:B:1938:VAL:HG13	1.96	0.48
1:B:2525:VAL:HA	1:B:2528:LEU:HD12	1.94	0.48
3:F:560:VAL:HA	3:F:565:TYR:HE2	1.79	0.48
1:B:385:ASN:HB3	1:B:388:ILE:HD12	1.95	0.48
1:B:965:SER:HA	1:B:968:HIS:CG	2.48	0.48
2:D:57:ILE:HB	2:D:70:LEU:HD11	1.96	0.48
3:F:579:TYR:HA	3:F:582:LYS:HD3	1.95	0.48
3:F:916:LYS:HB2	3:F:919:GLU:HG2	1.96	0.48
3:E:548:TRP:HA	3:E:551:ILE:HD12	1.96	0.48
3:E:331:LEU:HD23	3:E:334:ILE:HD12	1.95	0.48
1:A:104:ILE:HA	1:A:133:LEU:HD11	1.96	0.47
3:F:523:ASP:HA	3:F:557:TRP:HE1	1.79	0.47
1:A:976:THR:HA	1:A:1019:LEU:HD21	1.95	0.47
1:B:424:VAL:HA	1:B:430:ARG:HG3	1.96	0.47
1:A:1072:PRO:HA	1:A:1075:ILE:HD12	1.96	0.47
3:F:259:ASP:HB3	3:F:262:TYR:HB2	1.96	0.47
1:B:293:GLN:HA	1:B:515:PRO:HB2	1.96	0.47
1:A:1427:GLU:HG2	1:A:2395:ASN:HA	1.96	0.47
1:B:854:VAL:HG11	1:B:1622:ARG:HG2	1.96	0.47
2:D:66:ARG:HD2	2:D:77:PRO:HG3	1.97	0.47
3:E:111:ILE:HA	3:E:116:ILE:HG21	1.97	0.47
1:A:1421:ASN:HD21	1:A:1452:LYS:HB3	1.81	0.46
3:F:548:TRP:HA	3:F:551:ILE:HD12	1.98	0.46
1:A:1265:LEU:HD21	1:A:1294:ASP:HB2	1.97	0.46
1:B:1421:ASN:HD21	1:B:1452:LYS:HB3	1.80	0.46
3:F:137:GLN:HE22	3:F:1678:GLN:HE22	1.63	0.46
3:F:613:LEU:HD11	3:F:671:HIS:HB2	1.98	0.46
3:E:376:ILE:HG23	3:E:487:PRO:HB2	1.97	0.46
3:F:1636:LEU:HA	3:F:1639:ILE:HD12	1.97	0.46
1:A:1400:LYS:HE3	1:A:1412:ILE:HG23	1.96	0.46
2:C:16:ALA:HB3	2:C:319:ALA:HB3	1.98	0.46
3:E:81:TYR:HD2	3:E:119:LYS:HZ2	1.62	0.46
3:E:241:ARG:HD2	3:E:1442:ILE:HD12	1.96	0.46
3:E:682:PHE:HA	3:E:685:LEU:HD12	1.98	0.46
2:C:274:TRP:HE1	2:C:290:SER:HB3	1.81	0.46
4:H:34:HIS:HA	4:H:37:ASP:HB2	1.98	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:2141:PRO:HD3	1:A:2153:ILE:HD11	1.96	0.46
1:B:630:LEU:HD22	1:B:652:VAL:HG13	1.97	0.46
1:B:802:ILE:HA	1:B:805:LEU:HD12	1.98	0.45
3:F:996:SER:HA	3:F:1425:ILE:HG23	1.98	0.45
1:B:127:SER:HA	1:B:130:ILE:HD12	1.98	0.45
1:B:1010:GLU:HG2	1:B:1048:ILE:HG13	1.98	0.45
1:B:1125:PRO:HA	1:B:1132:ARG:HH22	1.82	0.45
1:A:80:ALA:HB1	1:A:84:LYS:HE3	1.99	0.45
1:B:2380:THR:H	1:B:2383:LEU:HD12	1.81	0.45
1:A:2387:MET:HE1	1:A:2392:LEU:HA	1.98	0.45
3:E:304:PRO:HG3	3:E:1438:GLN:HE22	1.80	0.45
4:G:76:TRP:CD1	4:G:76:TRP:H	2.29	0.45
1:A:690:ALA:HA	1:A:693:LEU:HD12	1.98	0.45
1:A:1939:ILE:HA	1:A:1942:LEU:HD12	1.99	0.45
1:B:1670:HIS:HA	1:B:1673:LEU:HD12	1.99	0.45
3:E:245:ARG:HB2	3:E:249:GLU:HG3	1.98	0.45
3:F:331:LEU:HD23	3:F:334:ILE:HD12	1.98	0.45
3:F:1637:LEU:HB3	4:H:93:LEU:HD22	1.99	0.45
1:B:293:GLN:HG2	1:B:516:ALA:HA	1.99	0.45
1:B:776:LEU:HA	1:B:779:LEU:HD12	1.99	0.45
2:C:92:GLY:HA3	2:C:101:TYR:CZ	2.52	0.45
3:F:660:PHE:HA	3:F:663:ILE:HD12	1.98	0.45
2:D:23:THR:HG22	2:D:39:GLN:HE22	1.82	0.45
3:F:346:PHE:HD1	3:F:421:VAL:HG13	1.81	0.44
1:A:1786:TRP:CZ2	1:A:1788:LYS:HD2	2.52	0.44
1:B:1031:MET:HA	1:B:1034:ILE:HD12	1.98	0.44
2:D:40:HIS:CE1	2:D:66:ARG:HH21	2.36	0.44
2:D:234:LEU:HD11	2:D:255:MET:HE2	1.99	0.44
1:A:1932:ILE:HA	1:A:1935:TRP:HD1	1.82	0.44
1:B:296:HIS:NE2	1:B:587:ARG:HD2	2.32	0.44
3:E:337:LEU:HD13	3:E:429:GLU:HB3	2.00	0.44
1:B:1961:LEU:HA	1:B:1964:ILE:HD12	2.00	0.44
1:B:145:VAL:HG13	1:B:175:LEU:HD13	2.00	0.44
1:B:656:LEU:HD23	1:B:659:LEU:HD12	1.98	0.44
1:A:1217:VAL:HG21	3:E:521:LEU:HD11	2.00	0.44
1:A:84:LYS:HE2	1:A:121:VAL:HB	2.00	0.44
1:A:885:ILE:HA	1:A:888:LEU:HD12	2.00	0.44
1:B:393:LEU:HB3	1:B:436:ALA:HB2	1.99	0.44
1:B:952:MET:HA	1:B:955:LEU:HD12	1.99	0.44
1:A:1684:GLN:HB3	1:A:1687:HIS:CE1	2.52	0.44
1:A:2411:LYS:HG3	1:A:2508:LEU:HD13	1.99	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:E:852:THR:HG21	4:G:4:LEU:HD11	1.99	0.43
1:A:75:VAL:HG22	1:A:114:LEU:HD11	1.99	0.43
1:A:1044:MET:HA	1:A:1049:GLN:NE2	2.34	0.43
3:E:124:LYS:HE3	3:E:1519:ASN:HA	2.00	0.43
1:B:656:LEU:HA	1:B:659:LEU:HD12	2.00	0.43
2:C:24:VAL:HB	2:C:38:VAL:HG22	2.00	0.43
3:E:121:LEU:HD11	3:E:160:LEU:HB3	1.99	0.43
1:A:483:PHE:HB3	1:A:520:VAL:HG21	2.00	0.43
1:A:1976:LEU:HB3	1:A:1995:LEU:HD21	2.01	0.43
2:C:136:LEU:HD11	2:C:140:GLN:HA	2.01	0.43
1:B:304:MET:HA	1:B:580:GLY:H	1.83	0.43
1:B:2008:GLN:HE22	1:B:2137:GLU:H	1.67	0.43
1:A:1500:LYS:HG3	1:A:1504:VAL:HB	2.00	0.43
1:B:1477:MET:HG3	1:B:1500:LYS:HE2	2.00	0.43
3:E:295:TRP:HZ3	3:E:394:LEU:HD13	1.83	0.43
3:E:785:HIS:HA	3:E:788:ILE:HD12	2.00	0.43
3:F:358:PHE:HA	3:F:362:TRP:CZ3	2.54	0.43
3:F:763:ASN:HB3	3:F:766:ILE:HD12	2.01	0.43
1:A:2048:PHE:CE2	1:A:2085:CYS:HB3	2.54	0.43
3:F:346:PHE:CZ	3:F:475:CYS:HB3	2.54	0.43
1:A:421:LEU:HD23	1:A:458:ILE:HD11	2.01	0.43
1:A:2380:THR:H	1:A:2383:LEU:HD12	1.83	0.43
1:A:630:LEU:HD22	1:A:652:VAL:HG13	2.01	0.42
2:D:14:ILE:HG23	2:D:54:ARG:HH21	1.84	0.42
1:B:746:ILE:HG22	1:B:749:ILE:H	1.84	0.42
3:E:169:LEU:HB3	3:E:191:ILE:HD11	2.01	0.42
1:A:825:MET:HE1	1:A:864:LEU:HD22	2.01	0.42
1:B:1910:TRP:CD1	1:B:1953:VAL:HG13	2.54	0.42
3:E:917:TRP:HA	3:E:920:ILE:HD12	2.01	0.42
1:A:1879:MET:HE3	1:A:1880:TYR:CZ	2.54	0.42
1:B:1101:GLN:HG3	1:B:1138:THR:HG23	2.02	0.42
1:A:776:LEU:HA	1:A:779:LEU:HD12	2.01	0.42
1:B:846:GLN:HE22	1:B:886:ARG:HH22	1.68	0.42
3:E:613:LEU:HD11	3:E:671:HIS:HB2	2.01	0.42
1:A:965:SER:HA	1:A:968:HIS:CG	2.55	0.42
1:B:2020:ALA:HA	1:B:2186:LEU:HD21	2.00	0.42
1:A:853:TYR:CE2	1:A:857:PRO:HD3	2.55	0.42
1:A:1274:ARG:HB2	1:A:1280:TRP:CE2	2.55	0.42
1:A:541:LYS:HA	1:A:552:LEU:HB2	2.02	0.42
1:A:1954:GLY:HA2	1:A:1957:ILE:HD12	2.02	0.42
2:D:40:HIS:CG	2:D:66:ARG:HH21	2.37	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:F:730:LEU:HD13	3:F:766:ILE:HG12	2.01	0.42
2:C:165:LEU:HD21	2:C:197:TRP:CE2	2.55	0.42
1:A:1751:PHE:HA	1:A:1754:LEU:HD12	2.01	0.42
1:B:396:LEU:HD13	1:B:416:THR:HG23	2.01	0.42
2:C:171:VAL:HG11	2:C:189:ASN:HD22	1.85	0.42
3:E:547:ASN:HB3	3:E:550:LEU:HD12	2.01	0.42
3:F:188:ILE:HA	3:F:191:ILE:HD12	2.02	0.42
1:A:210:VAL:HG21	1:A:266:LEU:HB3	2.01	0.41
3:E:794:LEU:HD12	3:E:805:LEU:HD13	2.02	0.41
1:A:656:LEU:HA	1:A:656:LEU:HD23	1.88	0.41
1:A:1374:LEU:HD12	1:A:1383:LEU:HD11	2.02	0.41
1:B:149:VAL:HG11	1:B:186:GLN:HB3	2.02	0.41
1:B:1786:TRP:CZ2	1:B:1788:LYS:HD2	2.55	0.41
2:C:136:LEU:HD21	2:C:140:GLN:HG2	2.01	0.41
3:E:270:GLU:HA	3:E:273:LEU:HG	2.02	0.41
1:B:198:VAL:HG11	1:B:267:ILE:HD11	2.01	0.41
3:F:836:ASN:HB3	3:F:925:ALA:HB1	2.01	0.41
1:A:681:GLU:HG2	1:A:717:ARG:HD2	2.02	0.41
1:B:1272:ALA:HB1	1:B:1274:ARG:HG2	2.02	0.41
1:B:2160:LEU:HD22	1:B:2172:LEU:HA	2.01	0.41
1:A:1477:MET:HE3	1:A:1477:MET:HB3	1.85	0.41
1:B:2340:HIS:CE1	1:B:2342:SER:HB2	2.55	0.41
2:D:180:PRO:HG3	2:D:230:PRO:HA	2.03	0.41
1:A:1643:VAL:HG23	1:A:1644:VAL:HG23	2.02	0.41
1:B:1196:ASN:HA	1:B:1199:LEU:HD12	2.03	0.41
1:B:1198:VAL:HG22	1:B:1201:ARG:HH22	1.86	0.41
1:B:1533:THR:HA	1:B:1536:ILE:HD12	2.03	0.41
1:A:746:ILE:HB	1:A:749:ILE:HD12	2.03	0.41
1:B:1042:TRP:CD1	1:B:1049:GLN:HG2	2.55	0.41
3:F:48:LEU:HD22	3:F:1686:HIS:CD2	2.56	0.41
3:F:473:LEU:HD23	3:F:476:LEU:HD12	2.03	0.41
1:A:1544:ALA:HB3	1:A:1567:ALA:HB2	2.03	0.41
1:B:2170:ARG:HB2	1:B:2186:LEU:HD23	2.03	0.41
2:D:136:LEU:HD11	2:D:140:GLN:HA	2.03	0.41
1:A:2034:ALA:HB1	1:A:2047:MET:HG3	2.02	0.41
1:B:693:LEU:HD23	1:B:696:LEU:HD12	2.03	0.41
1:B:1552:LEU:HD21	1:B:1602:VAL:HG11	2.03	0.41
1:B:1673:LEU:HD13	1:B:1700:TYR:HD1	1.85	0.41
1:B:2527:LEU:HD23	1:B:2530:LYS:HD2	2.02	0.41
3:F:382:ARG:HA	3:F:997:ARG:HB2	2.03	0.41
3:F:660:PHE:HB3	3:F:704:SER:HB3	2.01	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:2194:GLN:HG3	1:A:2421:PHE:HZ	1.86	0.41
1:B:115:LEU:HD21	1:B:130:ILE:HD11	2.03	0.41
3:E:199:PRO:HG3	3:E:240:THR:HG22	2.02	0.41
1:A:663:GLY:HA3	1:A:675:VAL:HG11	2.02	0.40
1:A:1613:GLU:HG2	1:A:1616:ARG:NH2	2.36	0.40
1:B:825:MET:HE1	1:B:864:LEU:HD13	2.02	0.40
1:A:2022:LEU:HB2	1:A:2024:HIS:CE1	2.56	0.40
1:B:1089:GLY:HA2	1:B:1128:PRO:HG3	2.03	0.40
2:C:40:HIS:CD2	2:C:66:ARG:HH21	2.38	0.40
3:E:990:TRP:CZ2	3:E:1430:PRO:HG3	2.55	0.40
1:A:396:LEU:HD23	1:A:399:LEU:HD12	2.04	0.40
1:B:1756:GLU:HA	1:B:1759:LEU:HD12	2.03	0.40
3:E:633:TRP:CZ2	3:E:656:SER:HB2	2.56	0.40
3:F:382:ARG:CZ	3:F:998:LYS:HG3	2.51	0.40
1:B:187:VAL:HA	1:B:190:PHE:HB3	2.04	0.40
1:B:1119:VAL:HA	1:B:1122:PHE:CE2	2.56	0.40
1:B:2303:LEU:HD23	1:B:2303:LEU:HA	1.90	0.40
3:E:293:ARG:HD2	3:E:851:LEU:HD22	2.03	0.40
3:E:635:ASN:HA	3:E:640:MET:HE3	2.04	0.40

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	2245/2590 (87%)	2185 (97%)	59 (3%)	1 (0%)	100	100
1	B	2241/2590 (86%)	2184 (98%)	56 (2%)	1 (0%)	100	100
2	C	313/326 (96%)	301 (96%)	12 (4%)	0	100	100
2	D	313/326 (96%)	302 (96%)	11 (4%)	0	100	100
3	E	1103/1734 (64%)	1079 (98%)	24 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	F	1103/1734 (64%)	1076 (98%)	27 (2%)	0	100	100
4	G	116/522 (22%)	111 (96%)	5 (4%)	0	100	100
4	H	116/522 (22%)	107 (92%)	9 (8%)	0	100	100
All	All	7550/10344 (73%)	7345 (97%)	203 (3%)	2 (0%)	100	100

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	180	PRO
1	A	569	GLY

5.3.2 Protein sidechains (i)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	1991/2248 (89%)	1991 (100%)	0	100	100
1	B	1990/2248 (88%)	1990 (100%)	0	100	100
2	C	267/276 (97%)	267 (100%)	0	100	100
2	D	267/276 (97%)	267 (100%)	0	100	100
3	E	1005/1562 (64%)	1005 (100%)	0	100	100
3	F	1005/1562 (64%)	1005 (100%)	0	100	100
4	G	111/470 (24%)	111 (100%)	0	100	100
4	H	111/470 (24%)	111 (100%)	0	100	100
All	All	6747/9112 (74%)	6747 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (97) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	193	ASN

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Mol	Chain	Res	Type
1	A	722	ASN
1	A	743	HIS
1	A	791	ASN
1	A	1049	GLN
1	A	1207	GLN
1	A	1348	GLN
1	A	1405	GLN
1	A	1421	ASN
1	A	1693	HIS
1	A	1715	GLN
1	A	1791	HIS
1	A	1803	HIS
1	A	1958	HIS
1	A	1992	ASN
1	A	2003	ASN
1	A	2007	GLN
1	A	2024	HIS
1	A	2028	HIS
1	A	2071	ASN
1	A	2148	GLN
1	A	2154	GLN
1	A	2180	HIS
1	A	2410	HIS
1	B	68	ASN
1	B	736	GLN
1	B	846	GLN
1	B	899	HIS
1	B	962	GLN
1	B	1077	HIS
1	B	1207	GLN
1	B	1311	ASN
1	B	1355	GLN
1	B	1366	HIS
1	B	1405	GLN
1	B	1424	GLN
1	B	1494	HIS
1	B	1553	HIS
1	B	1730	HIS
1	B	1739	HIS
1	B	1803	HIS
1	B	1808	ASN
1	B	1937	GLN

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Mol	Chain	Res	Type
1	B	1992	ASN
1	B	2003	ASN
1	B	2007	GLN
1	B	2117	GLN
1	B	2154	GLN
1	B	2223	GLN
1	B	2282	GLN
1	B	2531	GLN
2	C	30	HIS
2	C	71	ASN
2	C	198	ASN
2	D	39	GLN
2	D	122	GLN
2	D	283	GLN
3	E	178	GLN
3	E	233	HIS
3	E	242	GLN
3	E	300	ASN
3	E	432	HIS
3	E	435	ASN
3	E	559	ASN
3	E	658	HIS
3	E	694	GLN
3	E	900	ASN
3	E	958	GLN
3	E	1438	GLN
3	E	1485	GLN
3	E	1494	ASN
3	E	1632	HIS
3	E	1658	HIS
3	F	145	GLN
3	F	233	HIS
3	F	242	GLN
3	F	300	ASN
3	F	432	HIS
3	F	435	ASN
3	F	454	ASN
3	F	480	HIS
3	F	505	HIS
3	F	540	HIS
3	F	900	ASN
3	F	908	ASN

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Mol	Chain	Res	Type
3	F	947	ASN
3	F	988	HIS
3	F	999	HIS
3	F	1494	ASN
3	F	1658	HIS
3	F	1678	GLN
3	F	1686	HIS
4	G	18	HIS
4	G	115	GLN
4	H	18	HIS
4	H	88	GLN
4	H	139	GLN

5.3.3 RNA

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates

There are no oligosaccharides in this entry.

5.6 Ligand geometry

Of 2 ligands modelled in this entry, 2 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

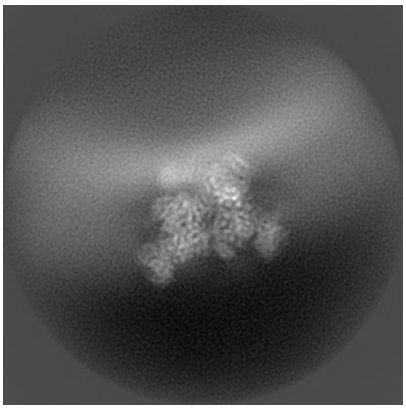
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-56117. These allow visual inspection of the internal detail of the map and identification of artifacts.

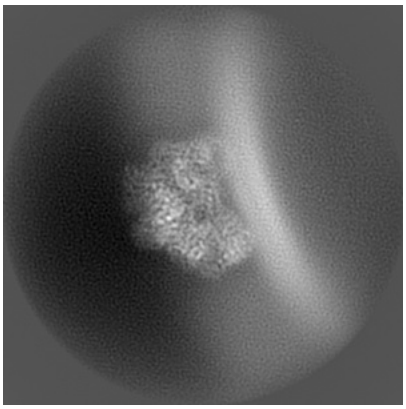
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections

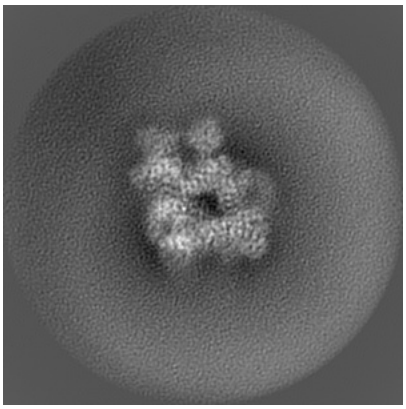
6.1.1 Primary map



X

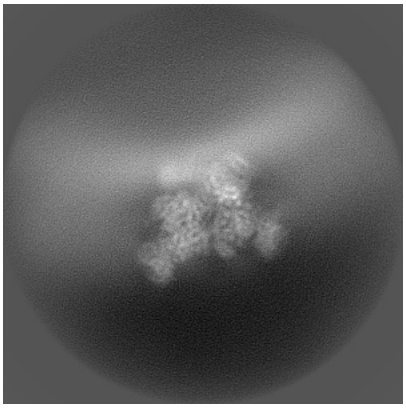


Y

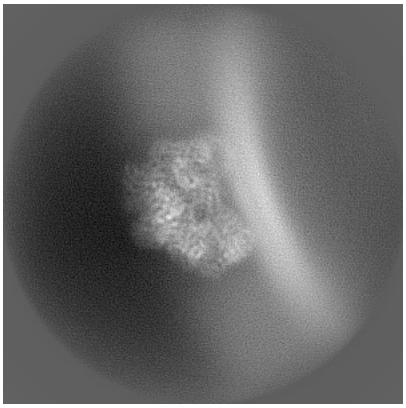


Z

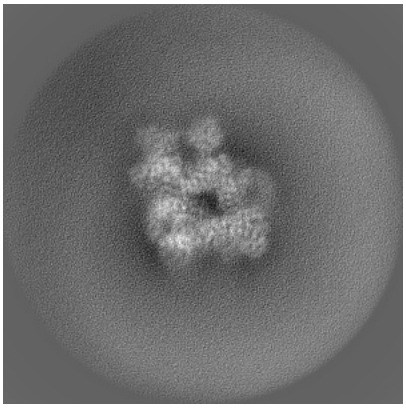
6.1.2 Raw map



X



Y

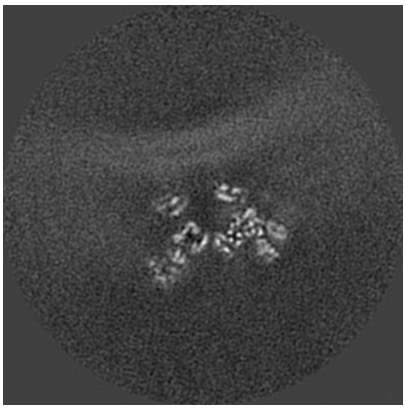


Z

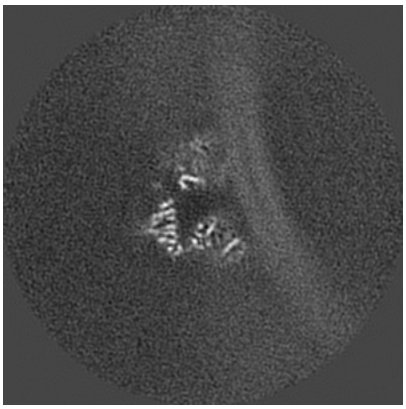
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

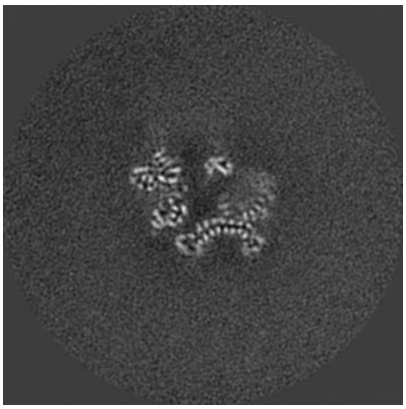
6.2.1 Primary map



X Index: 176

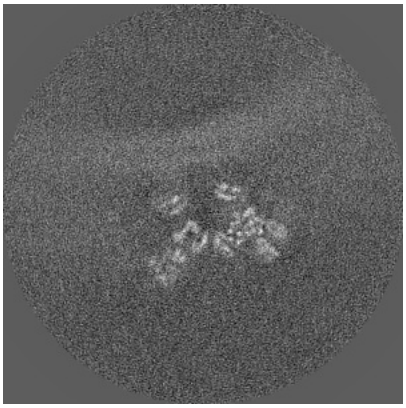


Y Index: 176

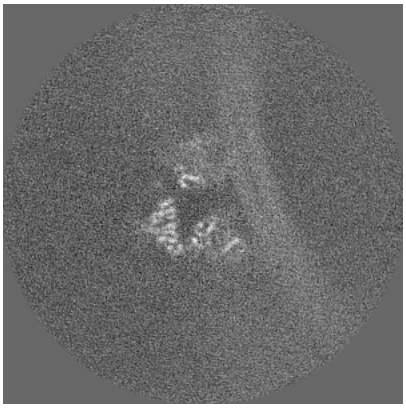


Z Index: 176

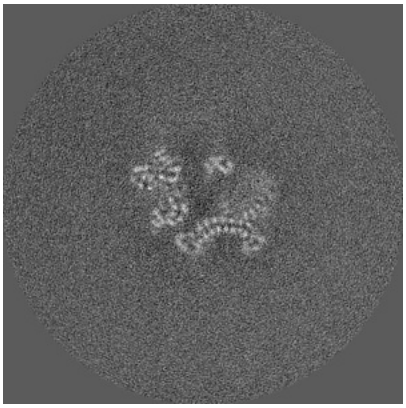
6.2.2 Raw map



X Index: 176



Y Index: 176

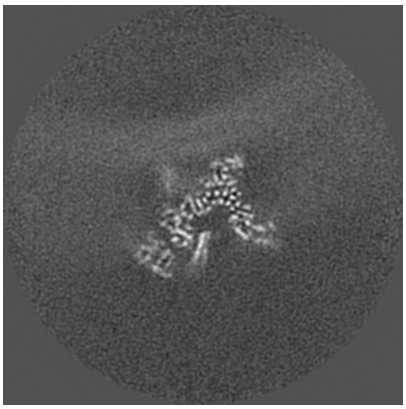


Z Index: 176

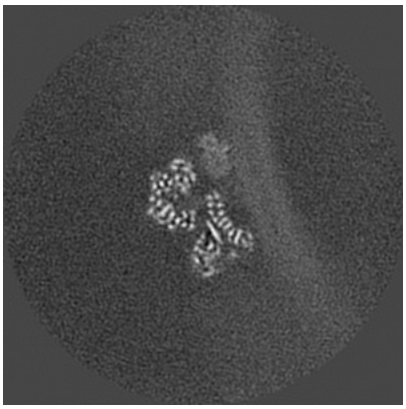
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

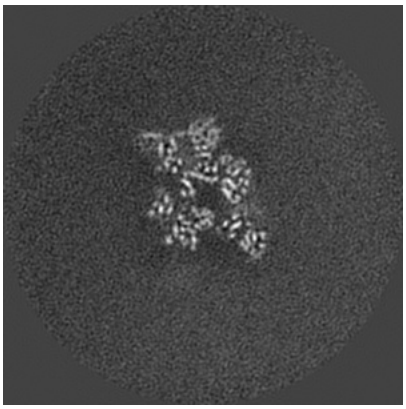
6.3.1 Primary map



X Index: 151

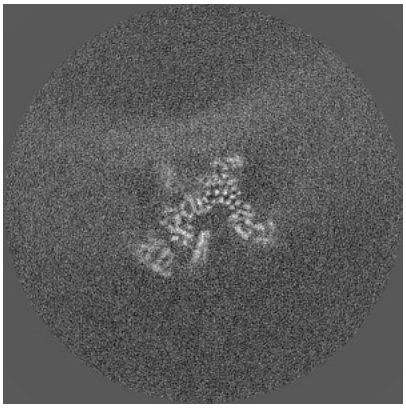


Y Index: 195

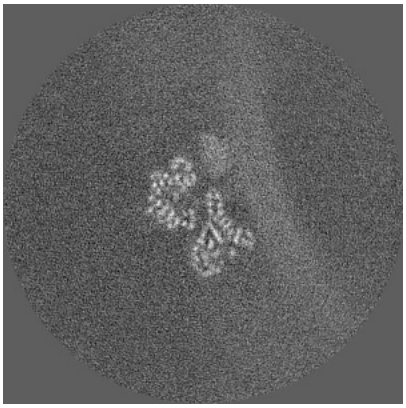


Z Index: 153

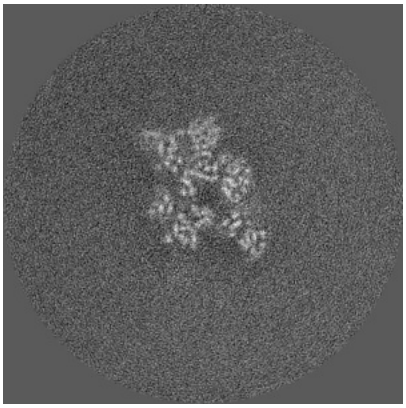
6.3.2 Raw map



X Index: 151



Y Index: 196

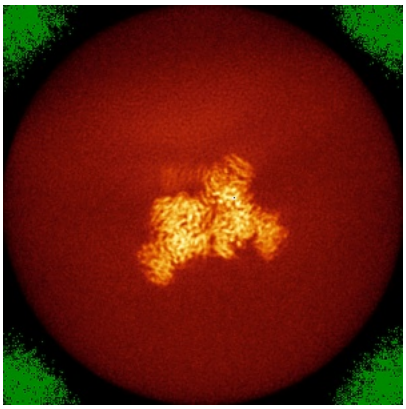


Z Index: 153

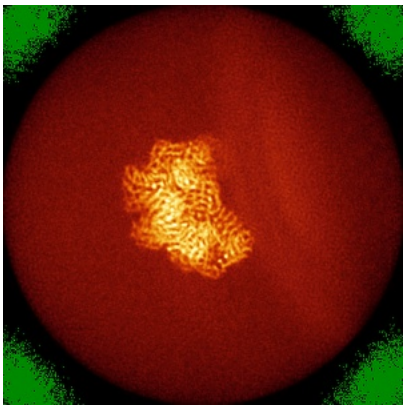
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) (i)

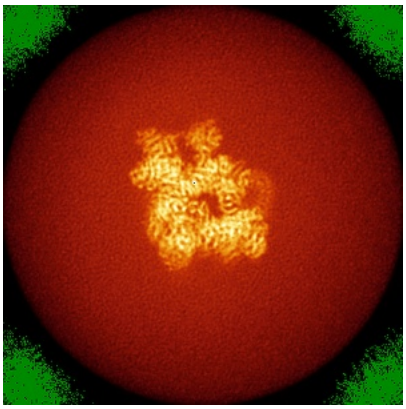
6.4.1 Primary map



X

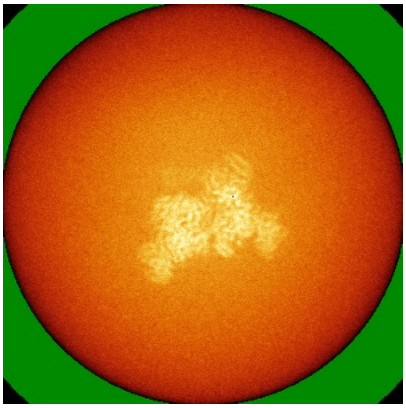


Y

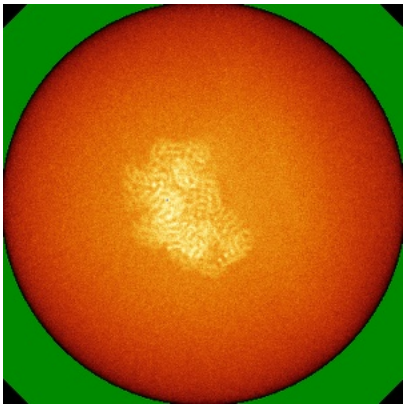


Z

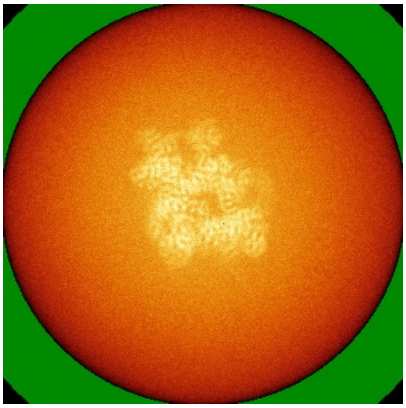
6.4.2 Raw map



X



Y

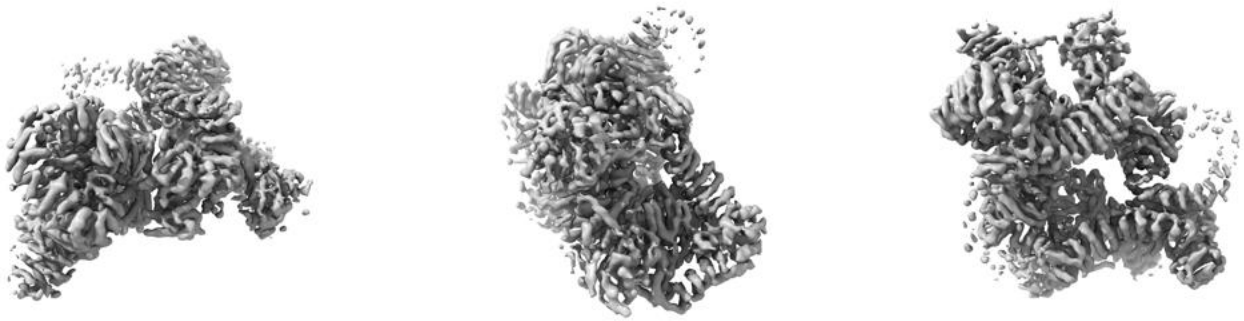


Z

The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views (i)

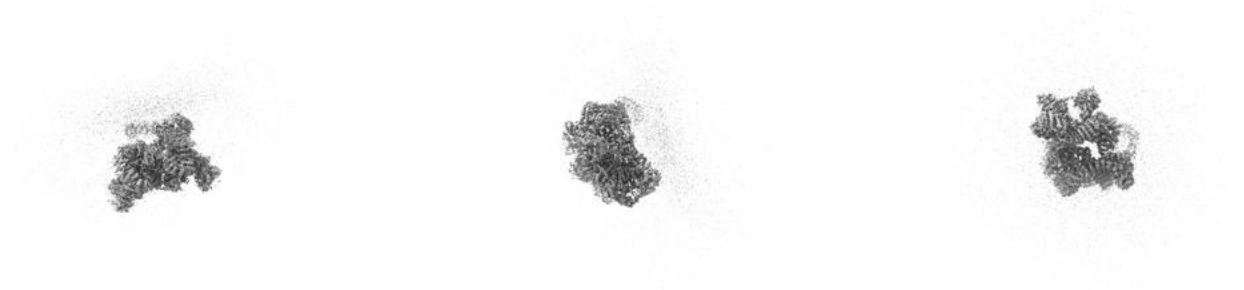
6.5.1 Primary map



X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.01. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



X Y Z

These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

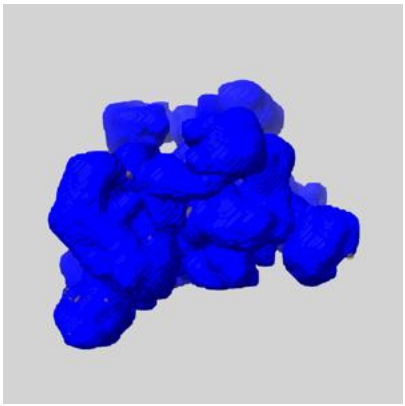
6.6 Mask visualisation (i)

This section shows the 3D surface view of the primary map at 50% transparency overlaid with the specified mask at 0% transparency

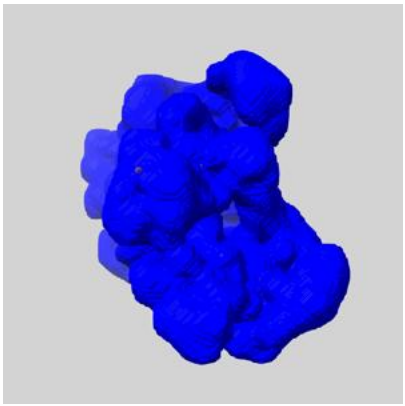
A mask typically either:

- Encompasses the whole structure
- Separates out a domain, a functional unit, a monomer or an area of interest from a larger structure

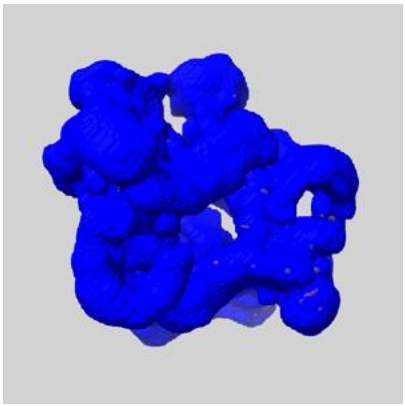
6.6.1 emd_56117_msk_1.map (i)



X



Y

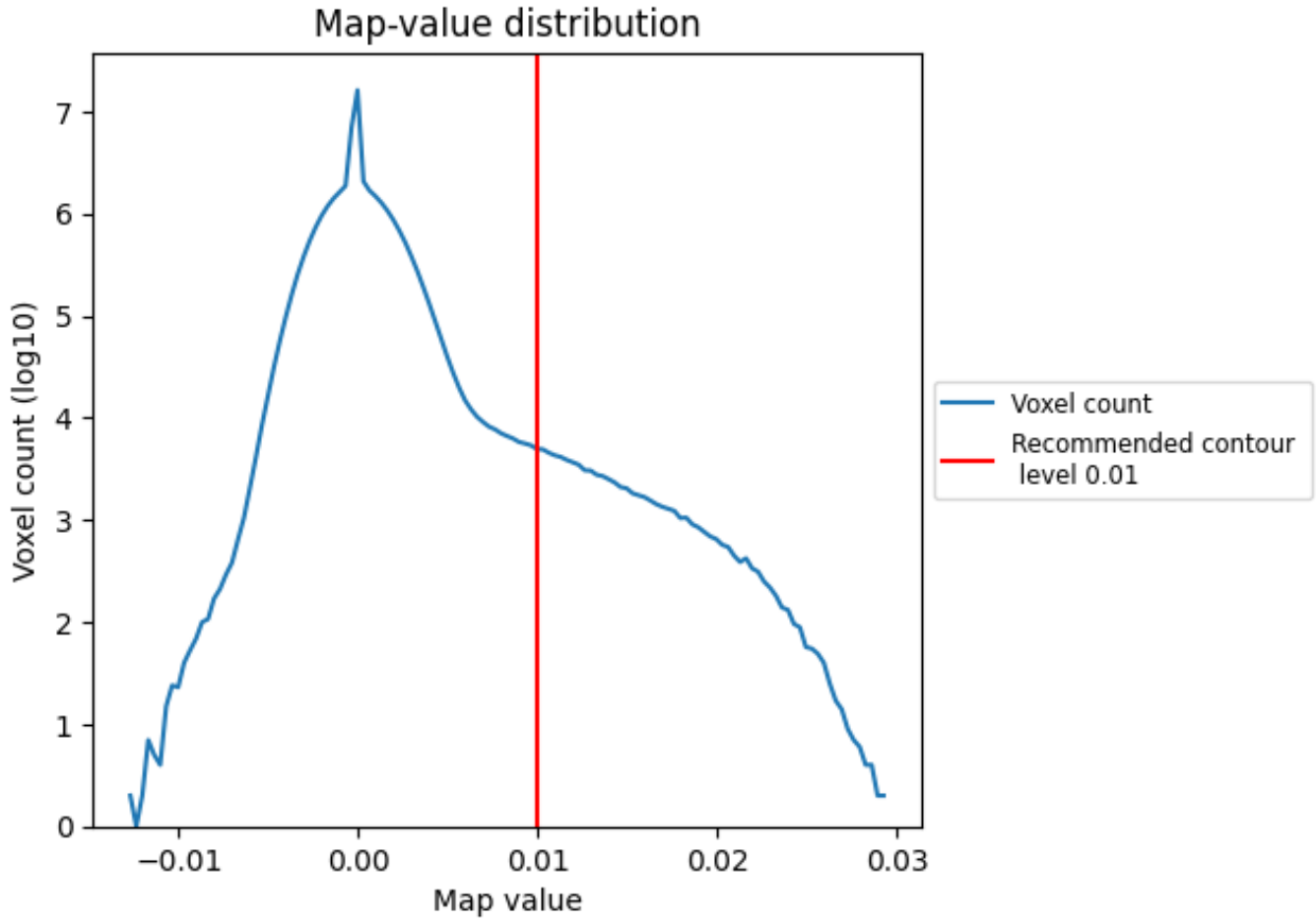


Z

7 Map analysis

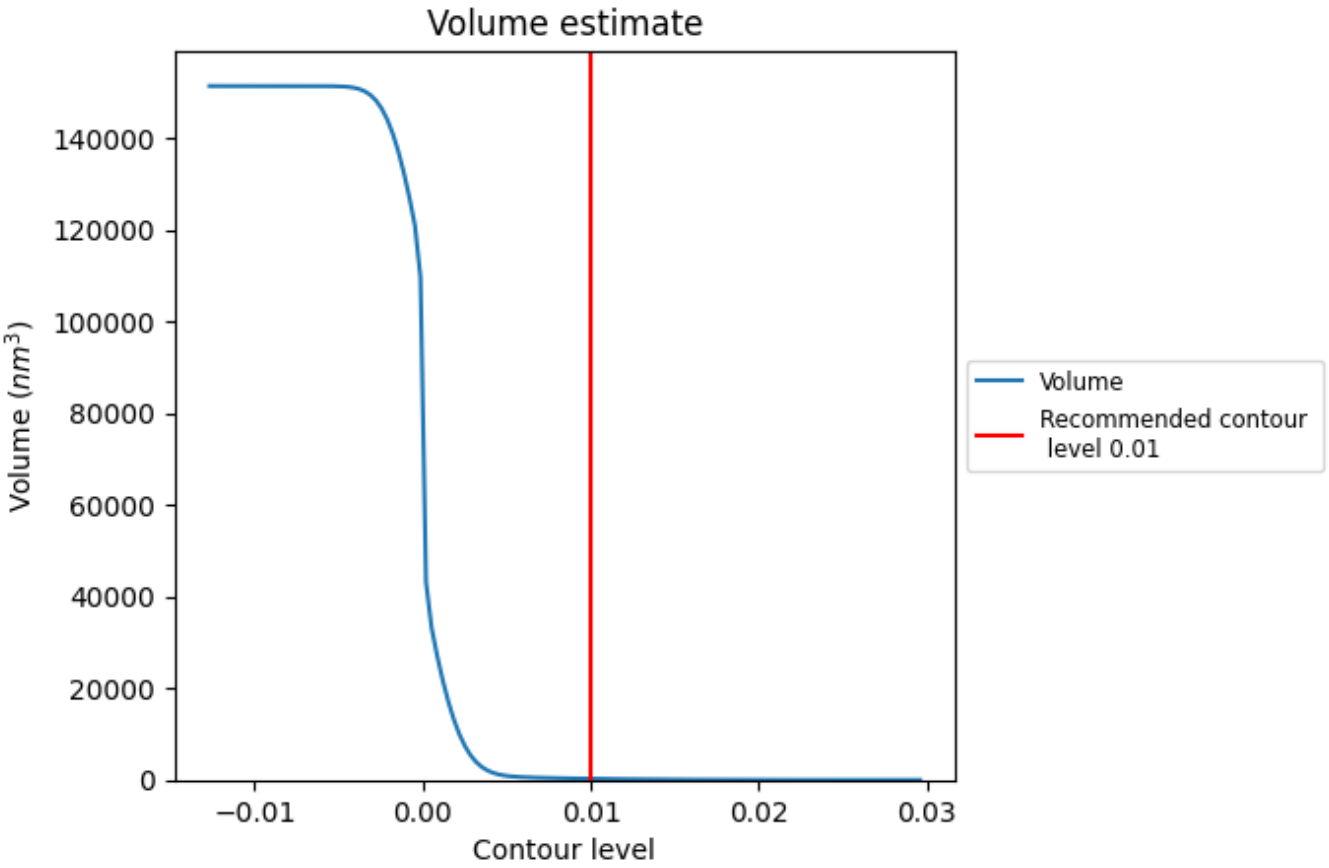
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution



The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

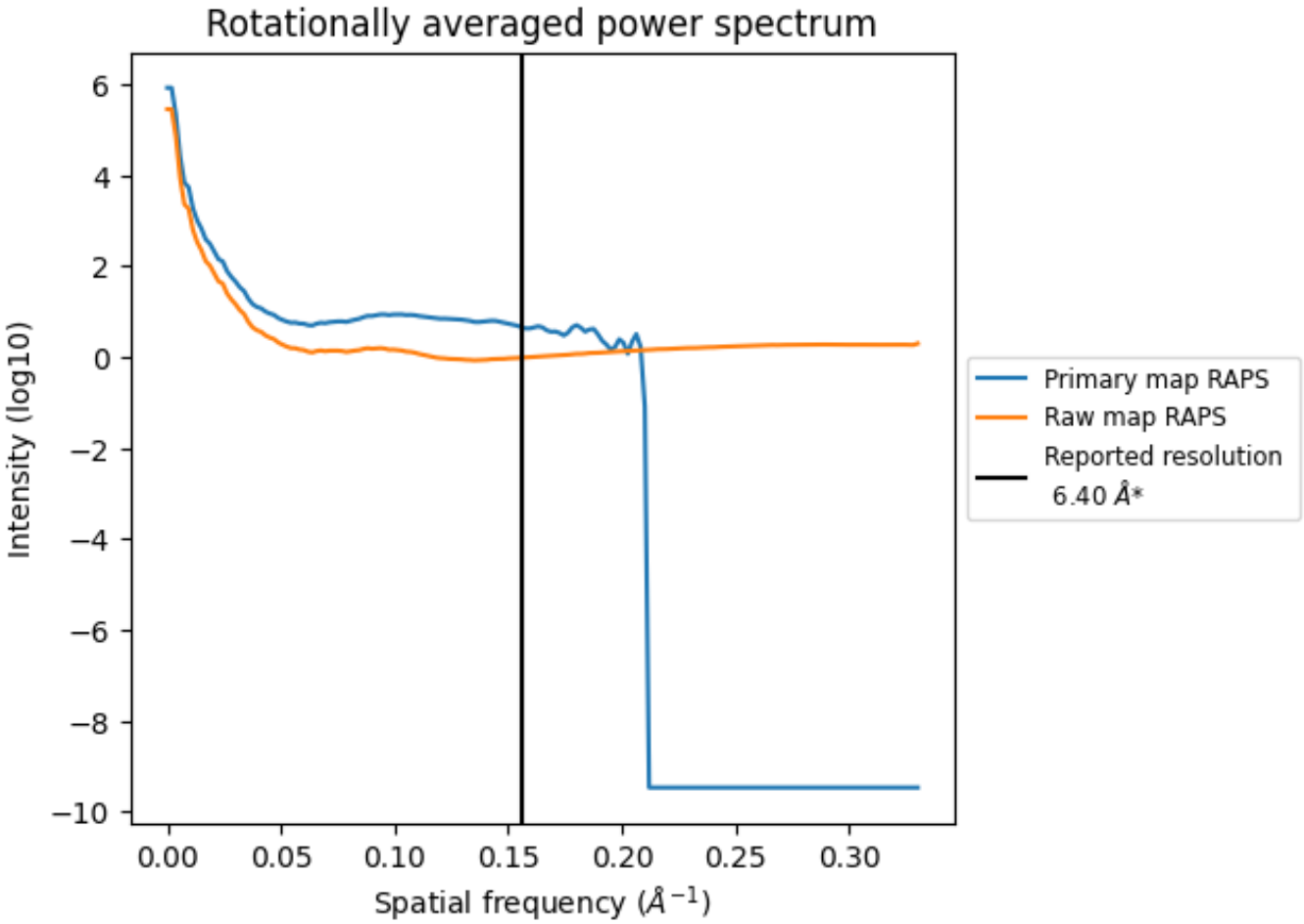
7.2 Volume estimate



The volume at the recommended contour level is 265 nm^3; this corresponds to an approximate mass of 239 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

7.3 Rotationally averaged power spectrum (i)

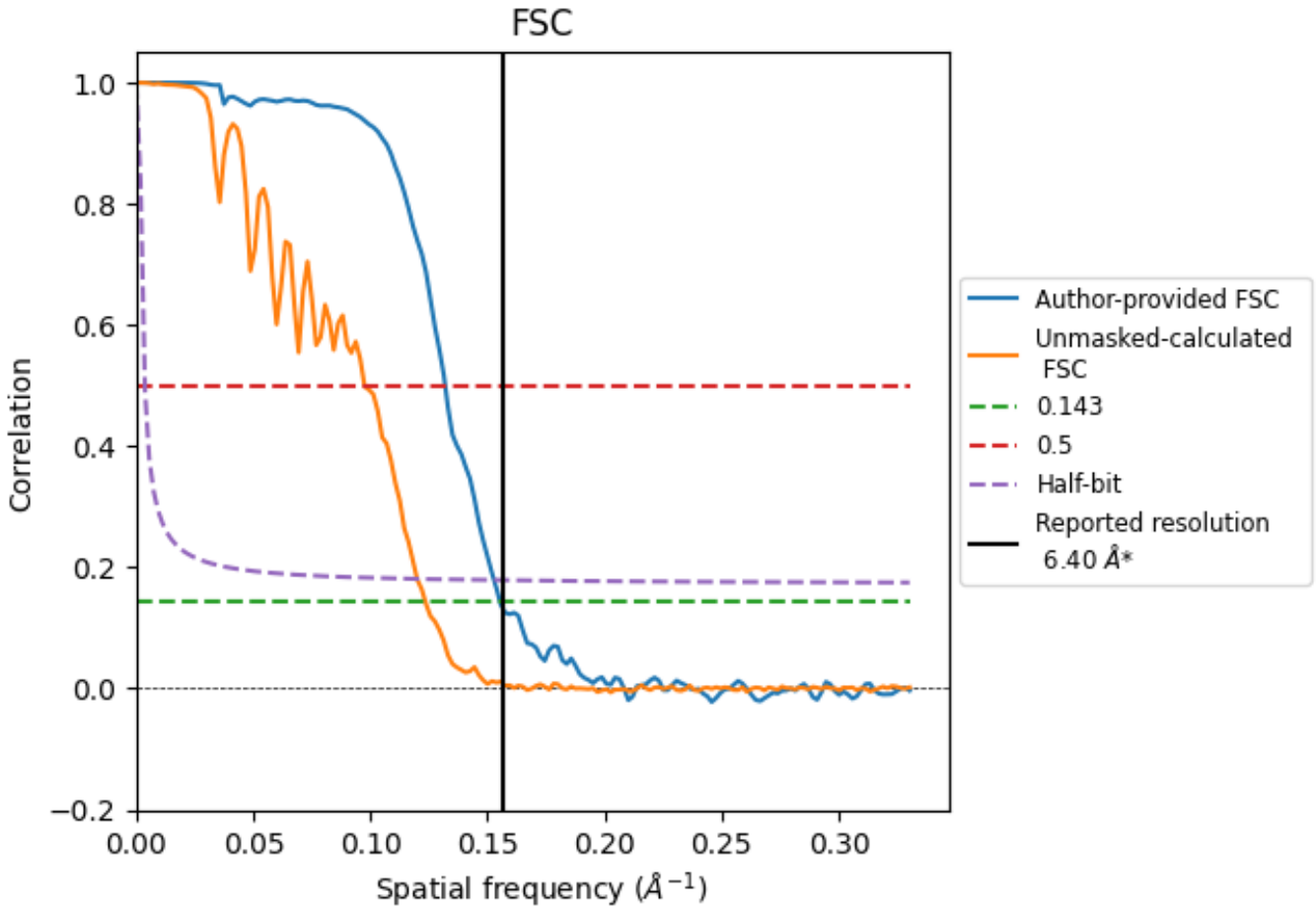


*Reported resolution corresponds to spatial frequency of 0.156 Å^{-1}

8 Fourier-Shell correlation

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

8.1 FSC



*Reported resolution corresponds to spatial frequency of 0.156 Å^{-1}

8.2 Resolution estimates (i)

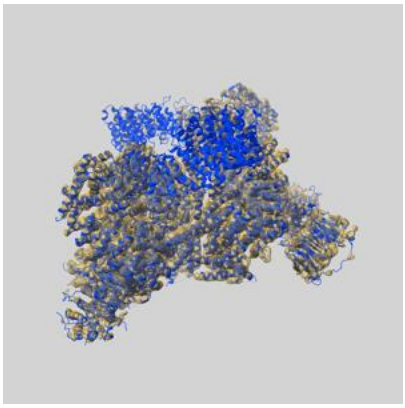
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	6.40	-	-
Author-provided FSC curve	6.44	7.58	6.54
Unmasked-calculated*	8.09	10.26	8.33

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 8.09 differs from the reported value 6.4 by more than 10 %

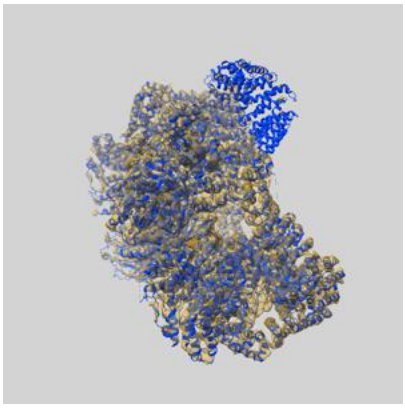
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-56117 and PDB model 9TPW. Per-residue inclusion information can be found in section 3 on page 9.

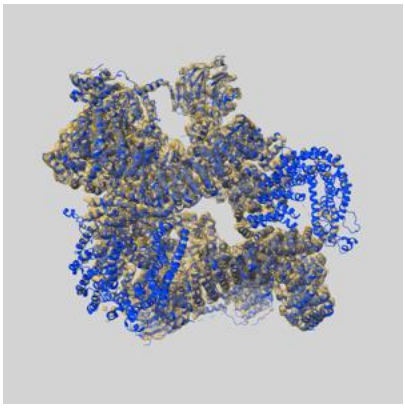
9.1 Map-model overlay



X



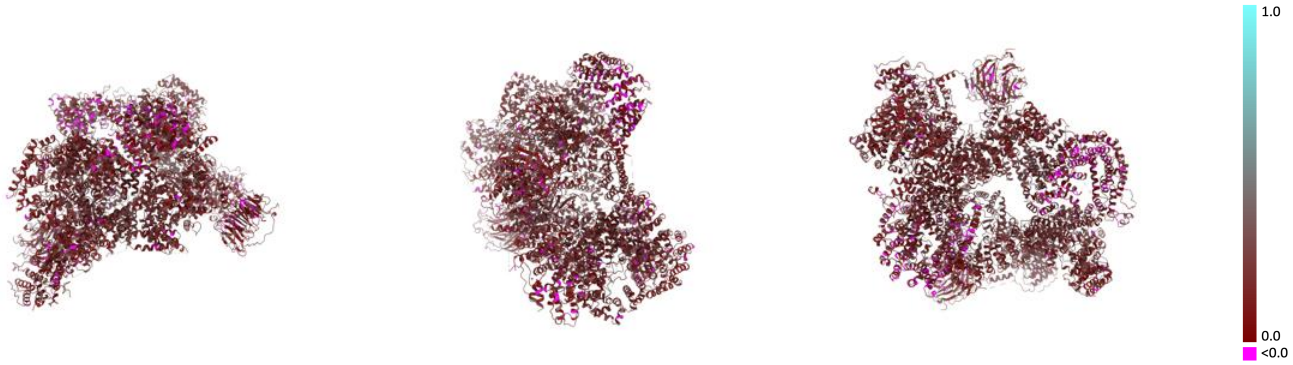
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.01 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

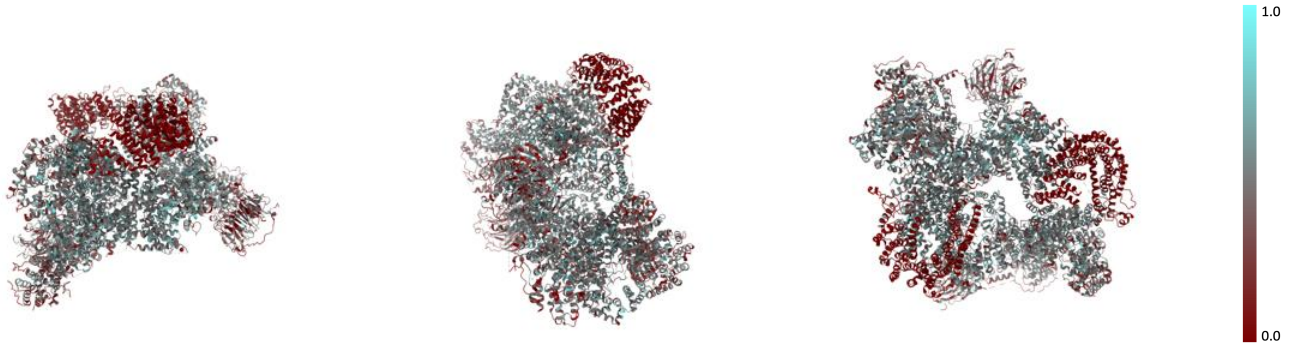
9.2 Q-score mapped to coordinate model (i)



X Y Z

The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

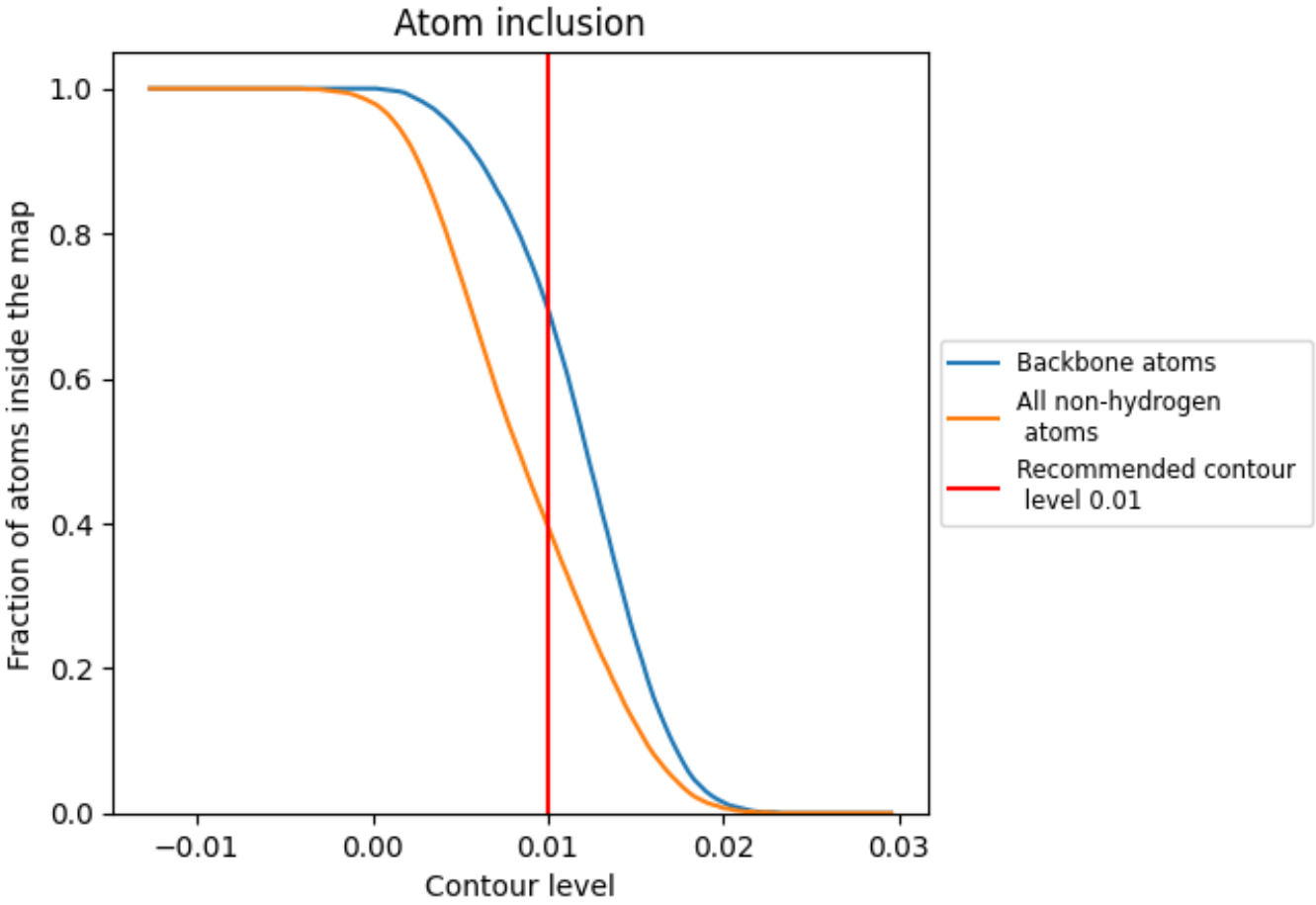
9.3 Atom inclusion mapped to coordinate model (i)



X Y Z

The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.01).

9.4 Atom inclusion (i)



At the recommended contour level, 70% of all backbone atoms, 40% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary (i)

The table lists the average atom inclusion at the recommended contour level (0.01) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.3960	0.1990
A	0.3940	0.1930
B	0.3900	0.1950
C	0.3030	0.1990
D	0.3120	0.1920
E	0.4350	0.2030
F	0.4540	0.2060
G	0.2340	0.2260
H	0.2560	0.2380